plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

DECEMBER 1956

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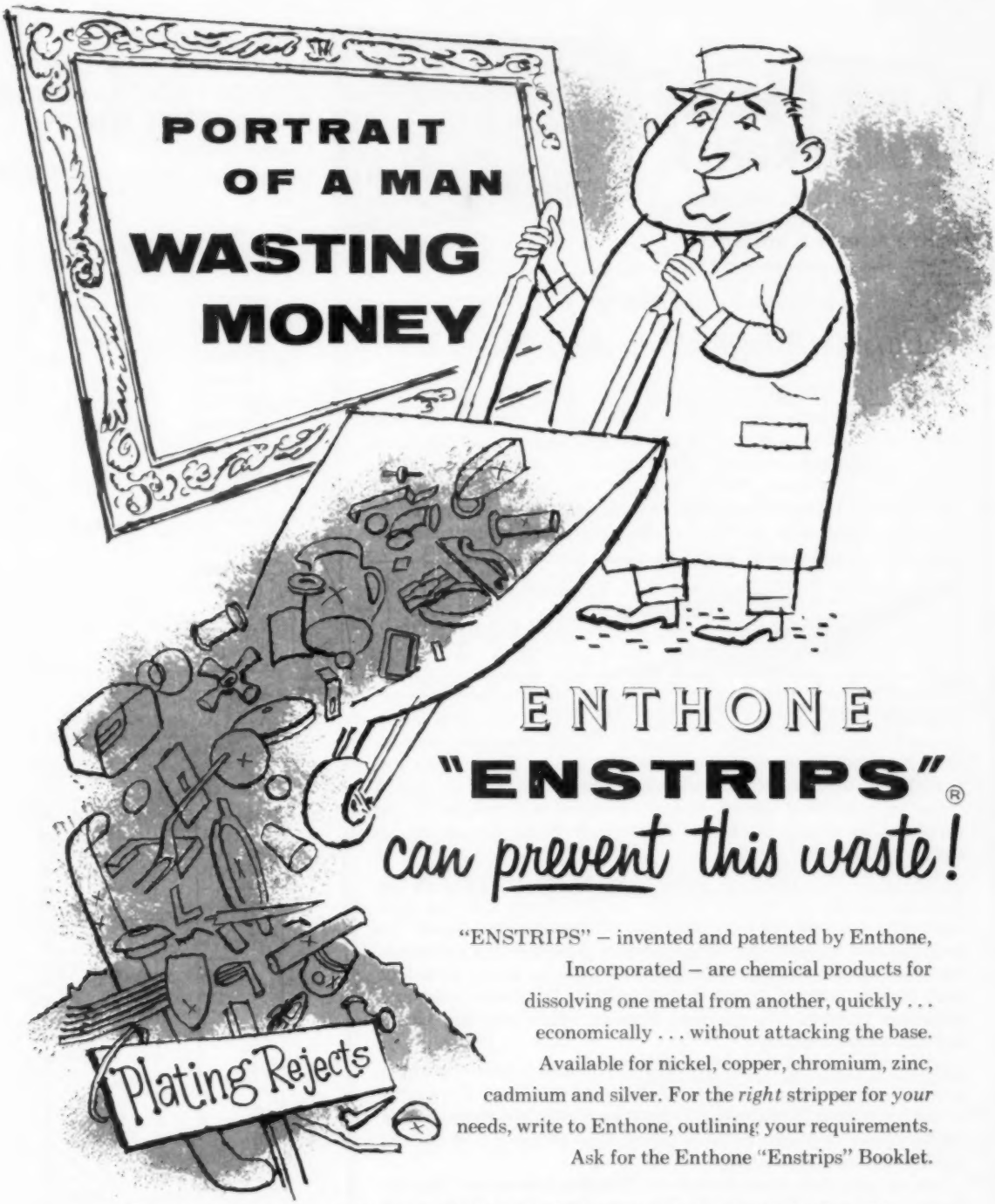

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by A. B. HOEFER
Vice-President
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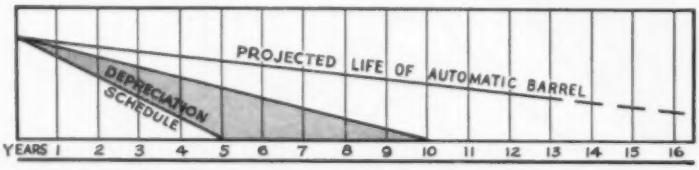

THERE ARE MANY OTHER SAVINGS you can enjoy beyond long life. Stevens Automatic Barrel machines require only one employee to operate the machine. These units are completely automatic, because the open end barrel is loaded when in a vertical mouth-upward position and automatically unloaded by tilting the barrel downward. There are no lids to fasten or unfasten.

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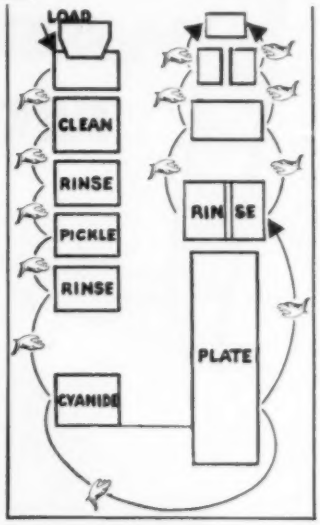
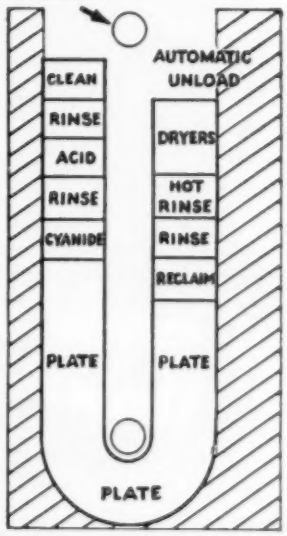


With this
Stevens Automatic Barrel Installation



Production from *both* installations is the same.

Notice how many more handling steps (indicated by the illustrated hands) and manual load-unload operations (indicated by the arrows) are required for the manual set-up.

Notice, too, how much floor space (indicated by shaded area) is saved with a Stevens automatic installation. No manual operations required with automatic load and unload.

An Educational Society for the Advancement of the Science of Electroplating, the Finishing of Metals and Allied Arts

plating

Journal of the American Electroplaters' Society

December 1956 **Vol. 43, No. 12**

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SOCIETY of BUSINESS MAGAZINE EDITORS

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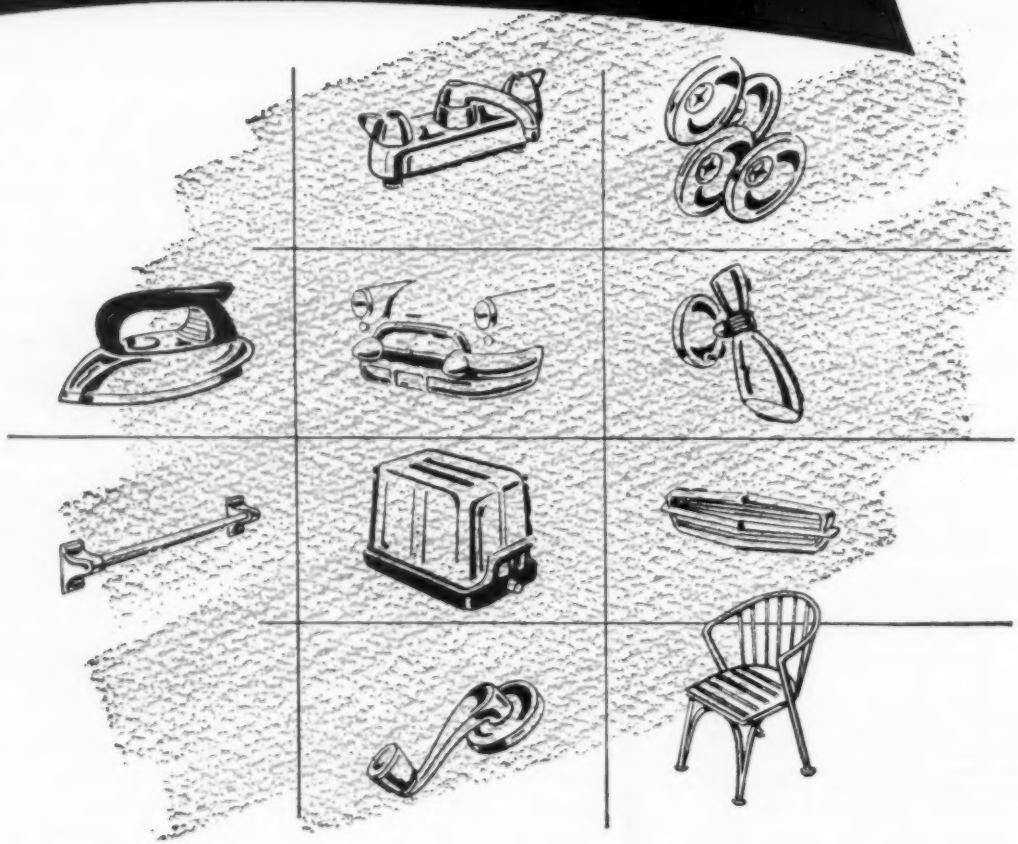

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EDITORIAL

THERE IS A SANTA CLAUS!

THREE score years ago—way back in the Christmastime of 1896—little Virginia O'Hanlon, then age 8, penned that storied question to the Editor of the *New York Sun*, "*Is there a Santa Claus?*". And she drew that hallowed answer from sage Francis Pharcellus Church of the *Sun*, "*Yes, Virginia, there is a Santa Claus.*"

In his assurance to little Miss O'Hanlon that there IS a Santa Claus, Mr. Church, of course, calculatedly dramatized one of life's greatest lessons—the axiom of giving of oneself so as, in turn, to receive—of contributing knowledge so as to reap wisdom—of serving so as to be served.

In the same sense, your American Electroplaters' Society (AES) provides the aegis under which professional men and technicians—scientists and artisans—electroplaters and metal finishers—give of themselves that they may receive—contribute knowledge that they may reap wisdom—serve to be served.

Within this framework, dedicated men have written the papers which, delivered before the Society's 43rd Annual Convention and published in the book TECHNICAL PROCEEDINGS just disseminated among its members, have enriched technical knowledge in electroplating, metal finishing, and allied arts.

Under this pattern, many men of good will are unselfishly lending mind and hand to the work of the Society's dynamic research program whose serious mission is to broaden the horizons of this field's intelligence and techniques for the mutual good of over 7000 members of the AES residing here and globally.

In this spirit, hundreds of progressive American and Canadian industrial companies are providing both sinew and the wherewithal through Sustaining Memberships in the AES, to help accomplish the foregoing fruitful mission.

Under this same pattern, busy men, motivated by common purpose, are voluntarily preparing technical papers for PLATING—are documenting manuscripts for the educational sessions of next June's Montreal Annual Convention—are planning to be present to participate in the deliberations of the Society's highest council, the Supreme Society, at its interim meeting convening in Pittsburgh, Saturday, January 12—are applying brain and muscle to the government and member service of the Society's 55 Branches here and in Canada and Australia—are manning effectively, the standing and special committees of the AES.

To each of these, in the sense of Francis Pharcellus Church, "*there is a Santa Claus.*"

So to these—to all other members of the Society—to non-member subscribers, advertisers, suppliers and friends of PLATING MAGAZINE—the AES, in the name of its Supreme Society, its Executive Board and its staff, extends its best wishes for a happy Christmas and a good New Year.

John P. Nichols

Executive Secretary

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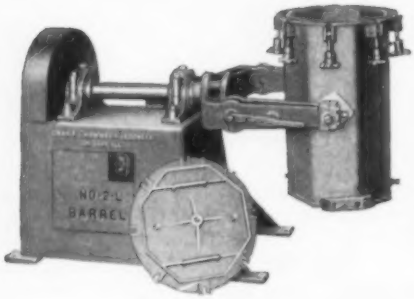

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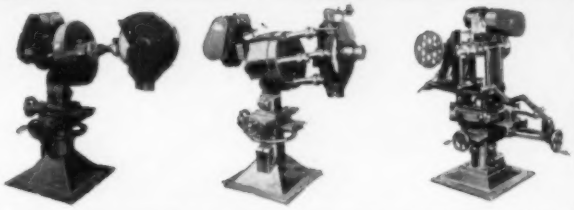
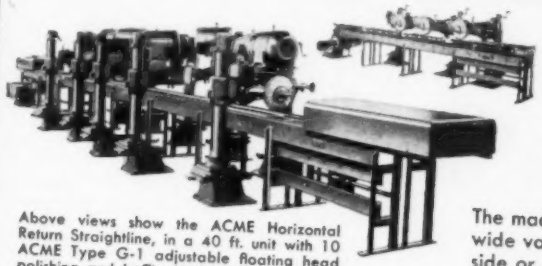


The three ACME Semi-Automatics above are from left to right, the ACME A-2, a 2 spindle hand indexing machine for polishing and buffing cylindrical parts up to 12" diameter . . . the ACME L-4, a 4 spindle automatic indexing machine with a normal range of 250 to 400 indexes per hour . . . and the ACME D-10, an oscillating machine for finishing out of round parts. These machines are proved producers.

WRITE FOR CATALOG ILLUSTRATING WIDE RANGE OF TYPES



Above views show the ACME Horizontal Return Straightline, in a 40 ft. unit with 10 ACME Type G-1 adjustable floating head polishing and buffing lathes . . . and a 20 ft. unit with 3 ACME Type G-3 lathes.

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WRITE FOR OUR STRAIGHTLINE CATALOG ILLUSTRATING OTHER TYPES

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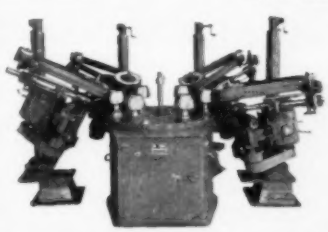
ACME 50" Continuous Rotary Automatic with 40 spindles equipped with 4 Acme Type G-3 heavy duty 15 H.P. polishing and buffing lathes with inverted spindles. ACME Continuous Rotaries are available with tables up to 24 ft. diameter.

WRITE FOR ROTARY CATALOG



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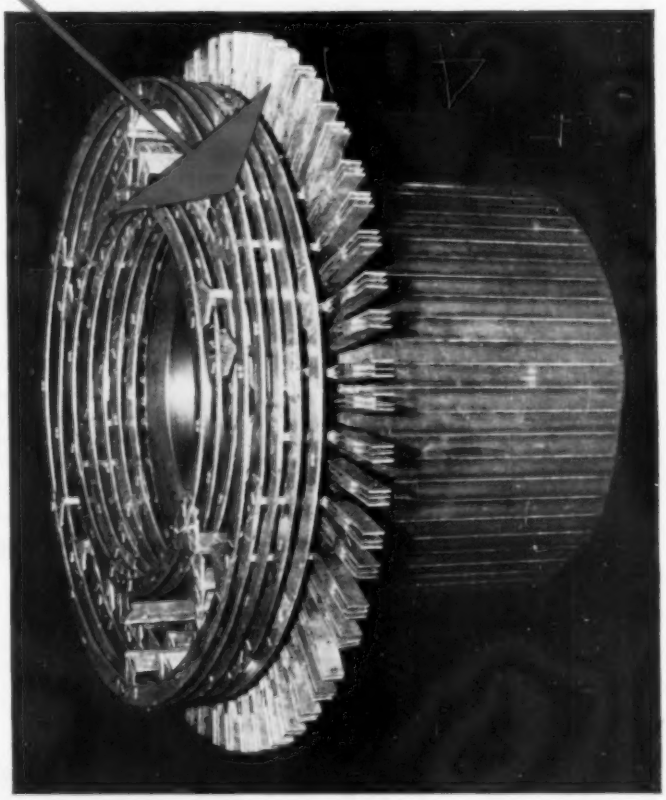

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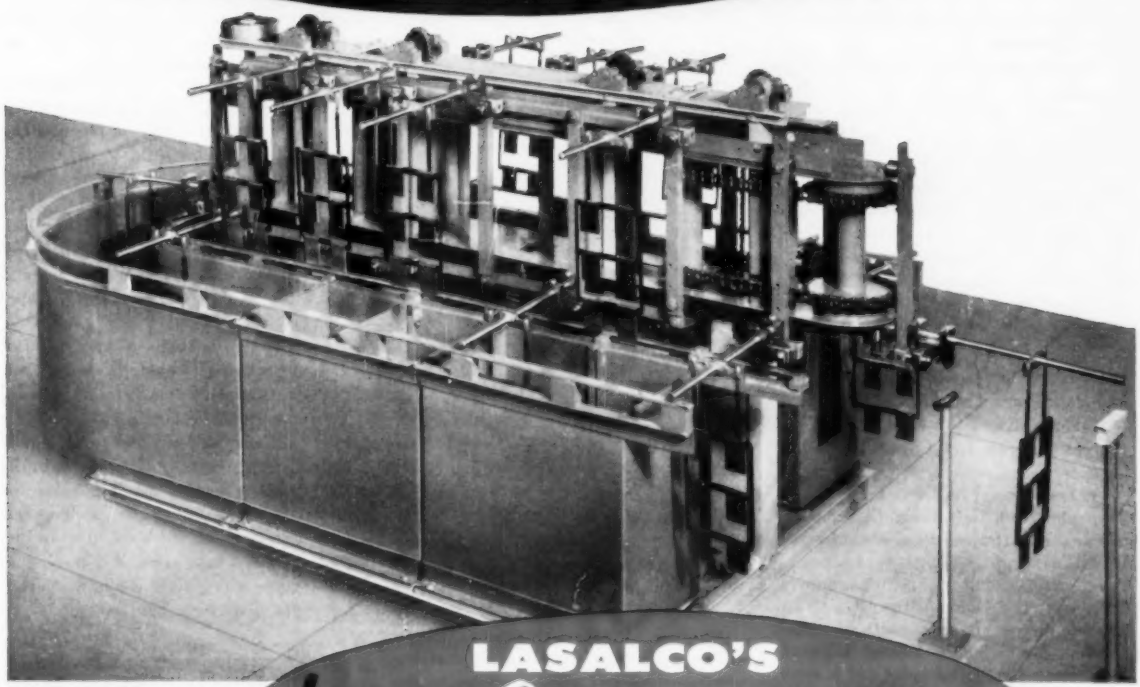

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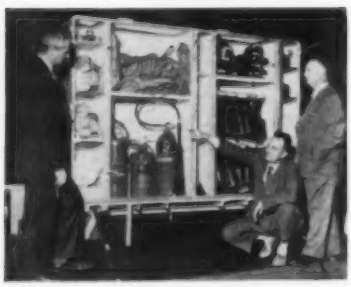
INDUSTRY NEWS

New Honeywell Plant—Minneapolis-Honeywell Regulator Company's Valve Division will construct a new three-acre manufacturing plant and home office at Fort Washington, Pa.

The 120,000-square-foot building, representing an investment of more than $1\frac{1}{2}$ million, will house the entire manufacturing, sales, research, development and administrative facilities of the Division, now located in Philadelphia.

The new plant, to be erected on a 25-acre site that will include a 300-car parking area, will be designed to accommodate the eventual expansion of the Division to some 1000 employees. Currently the Division employs 300 people. Producer of a wide variety of hydraulic, pneumatic and electric industrial valves for use in automatic control, the Valve Division is the oldest division of M-H, with some 100 years of manufacturing and engineering experience.

The modern brick-and-steel, single-story plant will be the eighth company to move into the industrial development known as Fort Washington Industrial Park. It is located in Montgomery County, Upper Doublin Township. This 550-acre project, 12 miles north of Philadelphia's City Hall, is located adjacent to the Pennsylvania Turnpike and is serviced by the Pennsylvania and Reading Railroads.



New mobile emergency equipment

Emergency Unit—Dana Corporation's Parish Pressed Steel Division, at Reading, Pa., is marketing a unique mobile Industrial Emergency Unit for use in connection with plant disasters.

The unit, which may be transported where needed by fork truck pickup, or easily pushed on its own rubber-tired wheels to a disaster area by two men, is eight feet long, seven feet high, and four feet wide.

General Scientific Moves—The General Scientific Equipment Company, manufacturers and distributors of industrial safety equipment, have expanded their manufacturing and warehousing facilities through removal to new and larger quarters. The company's new plant and offices are located at 7516 Limekiln Pike, Philadelphia 50, Pa.

Facilities at the new building have produced more efficiency and have permitted the addition of many new items to the company's line of industrial safety equipment.

Myron B. Diggin Joseph Cheung

Chinese Plating Student—Joseph Cheung, a Chinese student, is studying electroplating and allied processes in the Hanson-Van Winkle-Munning Company's Matawan laboratory.

Cheung is taking a free training program offered as a part of H-VW-M's overall export sales program. It is concerned primarily with the study of analysis and control of metal finishing processes. Cheung is associated with the Cheung Loy firm of Hong Kong, which has represented H-VW-M in the Far East for over 30 years.

Among the products which Myron B. Diggin, vice president of H-VW-M has personally explained to Cheung is Nickel-Lume, the new H-VW-M process being used in countries all over the world, including Italy, France, the Scandinavian countries, Mexico, Columbia and Hong Kong (Cheung's home). Since Nickel-Lume has been available to the export market for only a year or so, H-VW-M attributes its international success to several important advantages the process offers; faster plating; leveling qualities, which often eliminate subsequent buffing operations; easily controlled solutions; active surface for superior chromium coverage; high ductility and economic conversion from existing processes.

Levelume, a companion process, has also found favor throughout the world. This process is used where extreme leveling and fast plating are needed in addition to the other desirable characteristics of Nickel-Lume.

Automation For Small Business—Henry F. Dever, president of the Brown Instruments Division of Minneapolis-Honeywell, told 200 business executives at a Metal Manufacturers Association of Philadelphia meeting that it is the nation's small and medium-size businesses—those with 1000 employees or less—who can best profit from automation.

He said there are a host of mechanical, electrical and electronic instruments that sense, control and report on physical and chemical conditions vital to production that can be purchased at conventional equipment costs, ranging from $50 up.

Intelligently and appropriately applied, these instruments can result in a better quality product, with fewer rejects and less waste of men and machinery, Dever said.

He saw the natural tendency of automation equipment makers to design their products for the "volume market," another factor working for the small businessman. Of the nation's reported 308,000 manufacturing firms, only 1850 are in the 1000-employee-and-up bracket; the greater majority—or 306,150 to be specific—employ fewer than 1000. Thus, it's obvious that the small businesses, not the industrial giants, will provide the large market for automation equipment.

A scale model layout of General Electric's new Rectifier Department plant now under construction at Lynchburg, Va., inspected by Udylite Corp. executives, during a recent visit to the Rectifier Department's present facilites at Lynn, Mass. They also examined first production models of G. E.'s new air-cooled germanium plater. W. T. O'Brien, manager of manufacturing for the Rectifier Department, points out features of the plant layout to C. H. Reeme, president of Udylite (third from right), and L. K. Lindahl, Udylite board chairman (second from right). Other Rectifier Department executives, left to right, are L. G. Rappoli, manager of finance; A. Hansen Jr., manager of engineering, and A. E. Brostrom, manager of the relocation project

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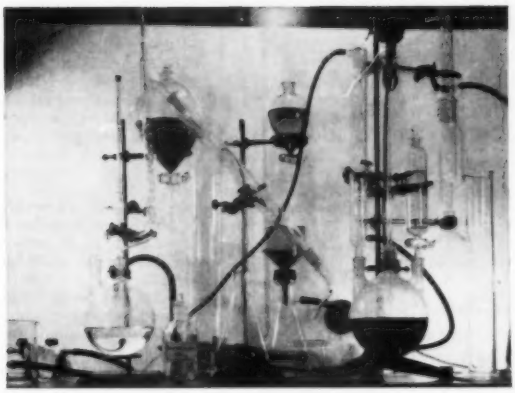

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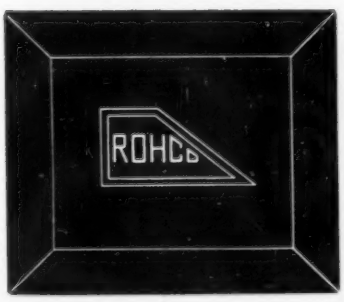

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Common sense is the greatest need in all our problems. If we apply a little metallurgical knowledge to our ideas about plating we can explain many things. Ductility is one of these metallurgical ideas. Just as surface tension in aqueous solutions can only be raised very slightly but lowered very drastically, ductility of an ordinarily ductile metal such as nickel can only be lowered by inclusions and impurities including those introduced by addition agents. Ductility of nickel plate is more dependent on the condition of the nickel solution and the conditions of operation such as voltage, temperature and agitation than on the obscure causes often suggested.

Addition agents can hurt ductility but help very little. The first step is to see whether addition agents used cause a lack of ductility. Generally they exaggerate the effects of impurities so that purity is essential. True Brite has considered this problem and tries to emphasize the conditions necessary for satisfactory ductility and discarded many ideas for additions which produce brightness at the loss of plate characteristics. Our bulletin on barrel nickel plating suggests formulas and conditions of operation.

Salt spray tests are well known and unreliable in prediction of actual service life but still widely used for specification. When necessary to meet salt spray tests all that is necessary to almost double salt spray resistance on nickel plate is to use a chrome solution rinse as part of the final rinse system. It produces no discernible film.

Plating brass in other than yellow colors is not simple. After years of work we believe we can tell you how to do it. At least our ideas are working pretty well in a variety of production. We haven't printed this bulletin as we think it needs more polishing but we have it typewritten for those needing the information. Write for a copy of our bulletin on Richlow brass (bronze) plating.

TRUE BRITE CHEMICAL PRODUCTS CO.
P. O. Box 31 OAKVILLE, CONN.

INDUSTRY NEWS BRIEFS

● The Small Business Administration has cooperated with the Department of Defense and other Government agencies, in setting aside $1,250,000,000 worth of Government purchases for exclusive competitive award to small firms.

It is the purpose of the Small Business Administration to help small firms obtain a fair share of Government purchases and to assist worthy small firms in their credit needs, when credit is not available from private sources on reasonable terms.

The Small Business Administration has worked out cooperative programs with seven Departments and Agencies of the Government to increase the flow of contracts to small firms.

These Agencies include the Department of Defense, the Departments of Agriculture, Interior, and Commerce, the General Services Administration, Atomic Energy Commission and the Veterans Administration.

To better acquaint proprietors of small firms with the opportunities for selling their goods, products and services to the Government, the Small Business Administration is conducting a series of small business opportunity conferences.

● The free course of study in electroplating given at the Fort Greene Evening High School, 29 Fort Greene Place, Brooklyn, N. Y., (formerly Brooklyn Evening Technical High School) will begin its spring term on February 4, 1957.

The session is divided into classroom discussion and laboratory experiments. The classroom topics will include simple calculations, reading graphs, chemistry of the plating tank, pH, wetting agents, pitting, deionizing. The laboratory experiments will include solution analysis, Hull cell studies, anodizing.

Registration begins January 28, 1957, and daily thereafter from 7:00 to 9:00 P.M. Classes will meet on Mondays and Wednesdays from 6:45 to 8:15 P.M. including about six Fridays. The term begins February 4 and ends June 27, 1957. L. Serota in Room BW17 or 3E10 is the registrar.

● Sixty-two of the nation's foremost experts in keeping the nation's factories running will lead discussions at the 8th Plant Maintenance and Engineering Conference at Cleveland's Public Auditorium in January. The conference will be held in conjunction with a record-breaking Plant Maintenance and Engineering Show during the first three of the four-day run of the show, January 28–31.

The show, largest in its history, will occupy all available halls in the Auditorium and will be one of the largest industrial expositions in 1957. Executives from virtually all of the country's largest industrial firms are expected to attend. An audience of more than 20,000 is anticipated for the show and some 2500 engineers for the conference.

● The findings reported recently by the Hygienic Guides Committee of the American Industrial Hygiene Association indicate the remarkable safety and use of an all but unknown solvent material, methyl chloroform. This committee of scientists, specialists in the control of industrial health conditions, report their findings after review of the thorough animal experimentation tests conducted on the material.

The solvent which has become commercially available only recently, looms as a substitute for carbon tetrachloride. Although almost identical in physical and cleaning properties it's shown to be much less likely to injure the user in almost every application where hand cleaning at room temperature is done.

● The City of Toledo, Ohio, uses the lime-soda ash process for water softening. This process raises the pH of the water to approximately 10.0–10.2. Following sedimentation, the water is recarbonated with CO_2 gas, which lowers the pH to approximately 9.5–9.6. The average pH of the Toledo tap water is 9.5.

● An increasing interest in international standardization was reported at the recent Seventh National Conference on Standards in New York City. The conference was held in conjunction with the 38th annual meeting of the American Standards Association.

FOR THE TOUGHEST CORROSION-PROOF TANK LINING

specify AMER-PLATE VINYL SHEET

—*molded* under 750 psi at 350° F. for maximum density.

Unlike other vinyl sheet linings, Amer-Plate is neither laminated nor calendered, but is molded under pressure and heat. The remarkable result is a smooth, extremely dense membrane, impervious to most plating and pickling solutions, oxidizing acids, alkalies and salt solutions. Being non-toxic and non-contaminating, it also may be safely used for lining tanks for food products.

Seams are easily heat-welded to provide a continuous impenetrable layer. Sheets are available in standard 3/32" and 3/16" thicknesses in both black and light gray.

Maximum adhesion is achieved with Amer-Plate 20Y Adhesive. This remarkable product bonds the Amer-Plate tenaciously to wood, steel and concrete surfaces so that once it has set, it is almost impossible to remove. Even in immersed temperatures as high as 160°, Amer-Plate 20Y Adhesive and Amer-Plate sheet lining remain completely unaffected. Amer-Plate membrane sheathed with acid-proof brick is an unbeatable combination for protection of high temperature pickling tanks and other critical applications.

Although Amer-Plate is resistant to most normal abrasion, if damaged, it can be repaired easily (even years later) right on the job.

Factory trained Amer-Plate applicators are located in all major cities to give you *immediate* service. You can be assured of expert workmanship—in the least amount of time. For additional technical data, please write:

Expert Application Insures Uniform Results

Electronically Tested Before Use

Ready For Years Of Dependable Service

Amercoat

CORPORATION

Dept. "DL"
4809 Firestone Blvd.
South Gate, California

Evanston, Illinois • Kenilworth, New Jersey • Jacksonville, Florida • Houston, Texas

PERSONALS

Benning

Pross

A. C. Benning long connected with the manufacture, sale and technical service of electroplating chemicals for Harshaw in the United States has been appointed manager of the newly formed Harshaw Chemicals, Ltd., of England.

This new company is a wholly owned subsidiary of the Harshaw Chemical Company of Cleveland. In addition to the office and manufacturing unit, installation has been made of a complete laboratory for analysis and service of Harshaw products.

S. E. Pross of Hounslow is the new assistant general manager. Among his previous connections, Pross had an extended tour of duty with the Kuhwait Oil Company in the Persian Gulf area.

Production in the plant will be limited at first to chemicals and materials for operating the Perflow, Perglow, Nubrite and Nibrite processes of electroplating. Other items manufactured by Harshaw are expected to be added as market demands can be developed.

Lowe

Bagwell

Clyde B. Lowe is now Detroit district manager for Cowles Chemical Company, Cleveland, Ohio. Announcement of Lowe's promotion came from Carl C. Clabaugh, manager of Cowles metal cleaner department.

Lowe will be in charge of the sale and servicing of Cowles' alkaline and other metal cleaners, Ty-Bond zinc phosphate metal coatings, and related metal finishing chemicals. He will work with Eaton Chemical and Dyestuff Corporation, distributors of Cowles' metal finishing chemicals in Michigan and Northeastern Ohio.

Lowe's home and headquarters will be moved to Detroit as soon as feasible. Meanwhile he will commute week ends from his home at 23707 Russell Road, Bay Village, Ohio—near Cleveland.

Lowe is a veteran of more than 16 years with Cowles' metal cleaner department. During most of that time he has worked out of Cowles' main office in Cleveland. He has also represented Cowles in Pittsburgh and in Chicago.

That portion of Lowe's territory that was located in Cleveland and Central Ohio will be absorbed into the territory now being covered by **Elmer A. Lord,** who will continue to make his headquarters in Cleveland.

Lowe is a life-long student of metal working and metal finishing. During World War II, his counsel was sought frequently by many defense contractors and sub-contractors on metal working problems that had never arisen before.

Charles E. Bagwell has been named chief engineer at Hanson-Van Winkle-Munning Co. He will be in charge of all equipment design and engineering for the company's line of automatic metal finishing machinery and processes.

Bagwell's experience and training in electronic controls and engineering design will be applied to extending new principles of automation and control to metal finishing problems. He will be chiefly concerned with advance design concepts for automatic conveyors, continuous plating equipment, electrical rotating equipment and metal finishing control systems.

He is a graduate of the U. S. Naval Academy (1943) and served in the European and Pacific theaters until 1946. Before attending Annapolis he studied chemical engineering at Georgia Tech. He also took graduate engineering courses at the University of Pittsburgh (1947-50) where he specialized in servomechanism theory, physics and the study of electronic controls.

Sid Mitwol has been named Midwestern sales manager for Sel-Rex Selenium and Germanium Rectifiers and "Double-Duty" filters. Having joined the company in 1948 as a sales engineer, Mitwol has progressed through positions of increasing administrative responsibility, and was Eastern sales manager prior to his current assignment.

Mitwol's headquarters will be the firm's Detroit office. His main responsibility will be to coordinate major equipment sales and to service Bart-Messing distributors in the area.

C. Foster Applegate has been appointed distributor representative in the East Central New York State area for Frederick Gumm Chemical Company. Applegate

Mitwol

Applegate

is a graduate of Colgate University and has previously been associated with the Hudson Motor Company, Columbian Rope Company, and the Holcomb Steel Division of Crucible Steel.

Dr. Nelson V. Seeger, of Cuyahoga Falls, Ohio, nationally known for his pioneering research and development work since 1946 in the fast-growing urethane plastics field, has been named to the newly-created post of associate director of Exploratory Research for Diamond Alkali Company, Cleveland.

In making the announcement, Dr. Albert W. Meyer, director of Exploratory Research, said that Dr. Seeger, in his new position, will hold primary responsibility for the company's development and research activities in monomer, polymer and radiation chemistry. He will be located at the Diamond Research Center in Painesville.

Eugene N. Castellano has been named manager of The Seymour Manufacturing Company's Bright Nickel department. Castellano's extensive background in chemistry includes four years of research and production chemistry in the electroplating field.

Prior to his present affiliation, he was with Bart Laboratories. He holds a BS degree in chemistry from Seton Hall University, and is an active member of the AES.

Peter Stevens has been named as sales engineer for the Midwest area for Sel-Rex Precious Metals, Inc., Belleville, N. J.

Stevens brings a background of 15 years' diversified experience in the metal finishing industry to his new position. Well qualified to assist accounts in his assigned territory from a technical as well as a sales point of view, his experience includes plant layout, cost analysis and trouble-shooting.

A Chemical Engineering graduate of Cooper Institute of Technology, Stevens has served as plating consultant and technical service man on the industrial applications of Sel-Rex Precious Metals for three years.

Stevens' temporary headquarters will be located in Chicago, although he will report to the Detroit office, located at 18040 James Couzens Highway, under the jurisdiction of S. S. Wilson, vice president in charge of Midwest operations.

Facts to consider when you're buying

Chromate Conversion Coatings

for Corrosion Protection, Paint Base, Decorative Finishing

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a nonporous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

If your company is manufacturing or buying parts or complete assemblies made from or plated with any of the more common non-ferrous metals—zinc, cadmium, aluminum, magnesium, silver, copper, brass or bronze—you've probably already run up against the question of finishing these surfaces with a chromate conversion coating. These coatings are used to protect against corrosion, or to provide a base for paint or to provide a decorative finish for sales appeal or shelf life. Since chromate conversion coatings represent a relatively new means of obtaining these finishes, this digest of facts to consider may be of value to you.

1. THE COATINGS THEMSELVES. There are many brands on the market. All are similar in many ways. Each, of course, offers its own specific advantages and these may relate to operating techniques, performance under actual use conditions, cost, availability, etc. Naturally, you'll want to choose a coating that is widely known and accepted under both military and civilian specifications.

2. THE COMPANY BEHIND THE PRODUCT. Is it a reliable, established organization? Does it offer experienced technical service, both from the field-engineering organization as well as the home office and laboratories? The man who sells and services your installation should be thoroughly familiar with not only chromate conversion coatings and their applications, but also with the characteristics and performance of related finishing operations such as precleaning, electroplating, painting, etc. This is most important since all steps of the finishing cycle must be functioning properly for the satisfactory performance of the ultimate finish produced.

3. AVAILABILITY OF THE PRODUCT. Ideally, of course, the material should be readily available to you from nearby warehouses to avoid time loss in long distance shipping and to provide emergency service, should the need arise.

4. COST. Naturally, the initial price of the material is important to you. However, just as you consider ultimate cost when you are buying mechanical equipment, ultimate cost must be considered for these finishing chemicals. So, it will pay you to investigate consumption costs, labor costs and the other factors which go into the determination of ultimate cost. Further, cost alone gives no indication of product performance, so careful attention must be given to the purpose the finish must serve and the value that finish will add to your product.

5. FACILITIES FOR RESEARCH AND DEVELOPMENT. Perhaps the existing types of chromate conversion coatings do not include a compound that will accomplish exactly what you wish. Then, it is important to deal with a supplier who has adequate research and development facilities available to work with you to produce a material to meet your needs. Naturally, such a project is seldom completed overnight. But, with complete cooperation and confidence from both you and your supplier, chances are a satisfactory program can be completed.

These are the concepts of sales and service on which we, Allied Research Products, Incorporated, have developed and marketed the line of Iridite chromate conversion coatings . . . superior product performance, complete sales and technical service, easy product availability, economical cost, extensive research and development facilities. No doubt you are familiar with our line and have seen this trademark—

IRIDITE®

—in our advertising, technical literature or on shipping containers in your plant. Remember this trademark when you're buying or investigating chromate conversion coatings for your company. It's your assurance of quality, economical products from a reliable and established company, skilled sales and technical service from both our home office and a national network of representatives, immediate availability from warehouses in strategic industrial areas and our willingness to work with you to develop new finishes to meet your needs, should the present line fall short.

For complete information on Iridite chromate conversion coatings, write today for your free copy of our technical data file. Or, for immediate advice, call in your Allied Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

ALLIED RESEARCH PRODUCTS
INCORPORATED
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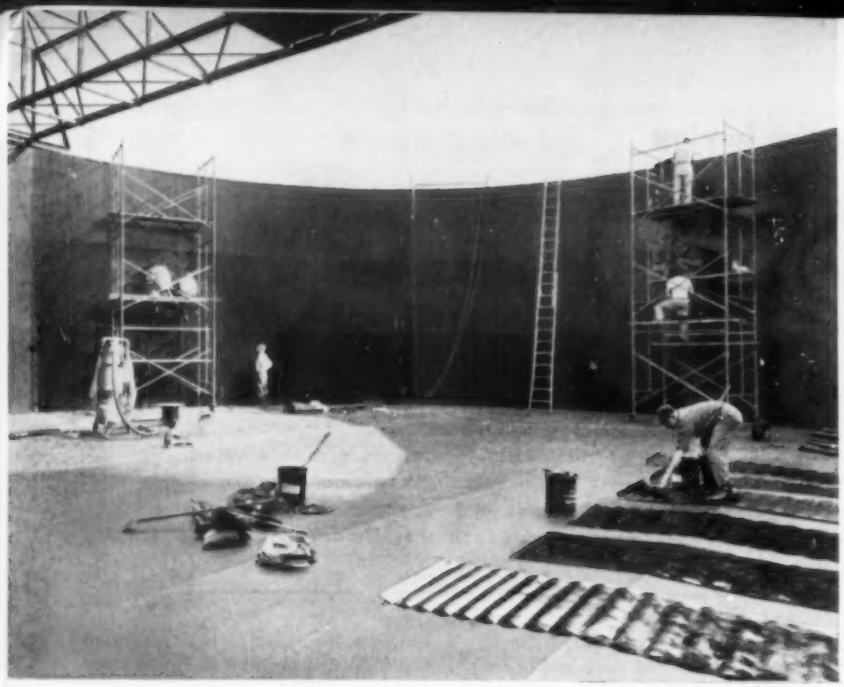
Manufacturers of Iridite chromate conversion coatings for corrosion resistance, paint systems, final finishing of non-ferrous metals; ARP Plating Brightener & Chemicals. West Coast Licensee—L. H. Butcher Co.



UDYLITE KOROSEAL* LINING

Answers The Waste Disposal Problem

Protection of the steel and concrete tanks from the corrosion of acids in waste disposal is a problem which must be answered with safety and permanence.

Koroseal* installed by Udylite is the answer because it is impervious to the attacks of acid and Udylite methods of application and welding techniques insure continuity of protection.

Here are tanks, eleven steel and four concrete, as large as the one pictured above—68 feet in diameter and 20 feet high. Udylite men of experience in Koroseal* lining work of all kinds are working to beat the weather man to complete this installation. Over 40,000 square feet of Koroseal* are being used to line these tanks.

Almost fifteen years of experience stand Udylite in good stead in Koroseal* lining in the factory or out in the field. Udylite developed the patented welding torch which welds each seam of the lining and assures the finest and tightest tank linings available. Special cements and special methods of applying the cements have improved the quality of tank linings—experience gained by many years of lining tanks in volume.

For tank linings of any kind—regardless of size or location—it will pay you to consult Udylite. Write us today.

*Product of B. F. Goodrich Company

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

PERSONALS

Fischer

Mazza

Emil Fischer, formerly director of Seymour Manufacturing's Bright Nickel Department, has been appointed resident New England sales engineer for Sel-Rex Precious Metals.

A technical man in every sense of the word, Fischer spent over ten years with the Seymour Manufacturing Company. His experience also includes several years with Farrel-Birmingham, Ansonia, Connecticut steel and iron foundry, as a technician.

Appointed primarily to service precious metals accounts in the area, Fischer will also represent Sel-Rex Selenium and Germanium Rectifiers, and Sel-Rex "Double-Duty" Filters.

The promotion of **John R. Mazza** to manager of manufacturing of the Bart-Messing Corporation, Belleville, N. J., has been announced by **Morris M. Messing,** president.

Mazza joined the company in 1950 as assistant chief engineer, and was advanced to chief engineer in July of 1955. An electrical engineering graduate of Pratt Institute, and a power option specialist, Mazza is credited with having contributed materially to the design of Sel-Rex Selenium and Germanium Rectifiers incorporating many innovations of circuitry and automatic, remote controls. Along with **E. R. Redlhammer,** vice president of Bart-Messing's Rectifier Division, Mazza was part of the team responsible for the design and manufacture of the greatest capacity, single unit rectifier in the world —two 50,000 ampere units at an Atomic Energy installation.

Mazza, whose headquarters will be at 155 Manchester Place, Newark 4, N. J., was formerly associated with the Richardson and Allen Corporation, rectifier manufacturers, as an electrical engineer in charge of testing and field installations.

Ben P. Sax, founder of American Buff Company, Chicago, has moved from president to board chairman of the firm.

A new management lineup for the company includes **Leonard B. Sax** as president; **Stanley P. Sax,** of Detroit, executive vice president in charge of sales; **Nathan E. Sax** vice president; and **Harold N. Sax,** secretary.

PERSONALS

Shockley

Wilson

H. Don Shockley has been named rectifier sales engineer for Hanson-Van Winkle-Munning Company's West Coast district. He will assist in the selling and servicing of H-VW-M rectifiers for metal finishing operations, particularly electroplating and anodizing. He will work through and with H-VW-M personnel and offices in Los Angeles and San Francisco.

Previous to joining H-VW-M, Mr. Shockley was with J. B. Seage, Inc., during this time he had considerable experience in the installation of electroplating equipment, particularly rectifiers.

He is a graduate of the University of Southern California where he received his BE in mechanical engineering in 1950.

Hazen P. Wilson was recently honored by the officers and employees of Eaton Chemical and Dyestuff Company, Detroit, upon completion of twenty-five years with the company.

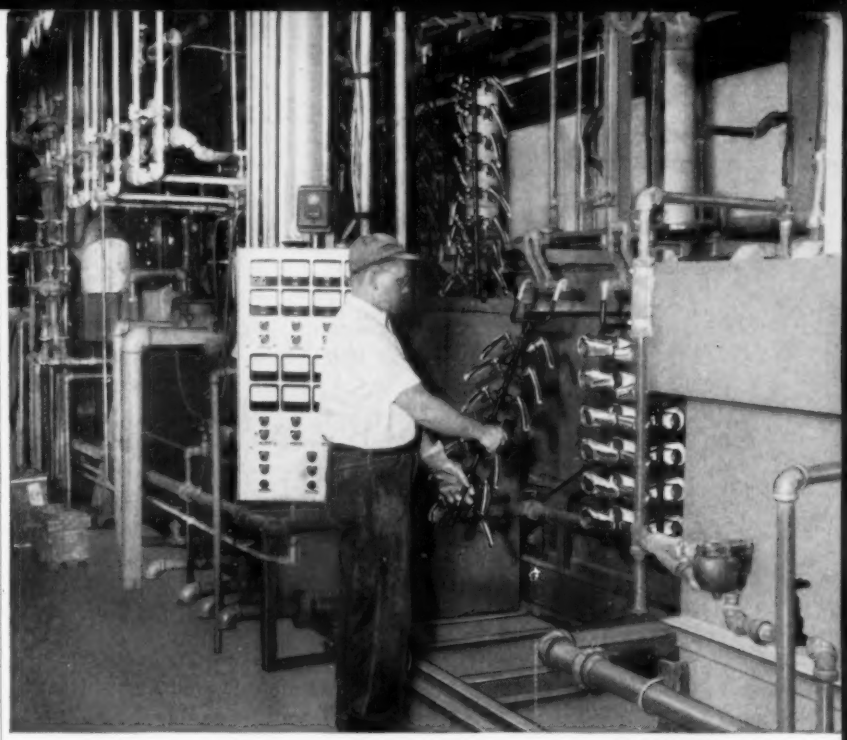
Wilson has been a member of the Industrial Chemical Division of the company since joining its sales force in 1931 and has made many friends in the chemical and electroplating industries.

On behalf of the company, R. F. McDonald, executive vice president and general manager, presented Wilson with a handsome silver bowl with inscription commemorating his twenty-fifth anniversary.

Walter Alina has been appointed plating department foreman by Security Steel Equipment Corporation, Avenel, N. J. He was a plating chemist for Hermetic Seal Products Co., Newark, N. J. In his new position, Alina will be responsible for the flow of production, quality of plating, and the maintenance and analysis of all solutions. Alina is a Seton Hall University graduate.

Richard Glen Howser recently became a Wyandotte Chemicals industrial representative in Denver, Colo.

Howser is a graduate of University of Tulsa and has twice served in the U. S. Army—first in the Air Corps and later as a Battery Officer and Instructor—a total of over four years. Since '53 he has traveled the Mountain States in industrial sales-service positions.



CUT YOUR PLATING TIME WITH THESE UDYLITE PROCESSES

HI-C Processes Give Faster Nickel Plate on Die Cast or Steel Parts

In plating some 5000 die cast and steel parts per hour, Rival Manufacturing Company of Kansas City, Missouri, use Udylite 514 HI-C and 31 HI-C bright nickel processes in combination with two Udylite Full Automatic Plating Machines.

The HI-C (high chloride) baths give faster bright nickel plate than any processes ever developed and at the same time brighter, more ductile and smoother nickel finishes. They are developments of the Udylite Research Corporation and are the only bright high chloride baths available commercially.

The HI-C processes plate nickel perfectly over copper for die cast parts and provide the important underlay for the final chrome plated finish. They are also used by Rival as the basic coating on steel before the chrome is applied.

As every electroplater knows, where the cycles of copper, nickel and chrome plating are used, nickel plating is the most time consuming. Therefore, Udylite's development of HI-C for speeding up the nickel cycle is of prime importance.

The use of Udylite Full Automatics by Rival has greatly increased efficiency and economy. Only one man is required to inspect the parts and operate each machine. Now there is complete coordination between fabricating, finishing and assembly. HI-C processes and the controlled time cycle of plating have improved the quality of finish and greatly reduced rejects.

A Udylite HI-C nickel process and a Udylite Automatic Plating Machine will save time, money and improve your product. Let us tell you how. Write us today.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

When you deal with Federated sales and service engineers you'll find their talk of extra service is more than just lip service. As an example, Federated provides free bath analysis for plating shops that wish to use Zimax, the efficient addition agent for zinc plating; and free adjuster solutions are provided with Cadmax, Federated's effective brightener for cyanide cadmium plating, so that no break-in period is required.

Federated provides a well rounded line of quality plating materials and electrochemicals:

ANODES:

All types of copper; zinc; tin; tin-lead; cadmium; brass; silver and lead anodes, including the famous Conducta-Core that lasts three times as long, gives greater throwing power.

NICKEL SALTS:

Domestic nickel salts produced under quality control methods that assure identical plating characteristics from every lot.

ADDITION AGENTS:

Zimax and Cadmax provide maximum throwing power, maximum coverage, maximum allowable current density, maximum brilliance and maximum lustre.

Talk to your Federated dealer or sales engineer to convince yourself that Federated's knowledge and nation-wide facilities can help increase shop efficiency and add to your profits.

Federated Metals

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Aluminum, Anodes, Babbitts, Brass, Bronze, Die Casting Metals, Lead, Lead Products, Magnesium, Solders, Type Metals, Zinc Dust

PERSONALS

Howser

Weekly

Before being assigned to his Denver headquarters, Howser was given intensive product application schooling by the Wyandotte Chemicals Research and Technical Service Laboratories and received industrial field training in the aircraft, metal finishing and petroleum industries.

To expand new product service facilities, Mac Dermid, Incorporated, Waterbury, Conn., recently appointed **Claude E. Weekly** to the newly created post of Product Service Engineer.

Under Weekly's guidance, Mac Dermid product developments, originating in the company's research laboratories and tested in the new customer service laboratory, will be tested under production conditions in customer's plants. The first of several product service engineers, Weekly will devote full time to product testing and development in the field. He brings to the company more than twenty years of metal cleaning, plating and finishing experience.

Claude Weekly has been active in all phases of metal finishing as foreman, supervisor of finishing rooms, metal finishing rooms, metal finishing consultant and service manager, his most recent position with Promat Division of Poor & Co. He is a charter member and past-president of the Indianapolis Branch, AES.

As Product Service Engineer, Weekly will work closely with manufacturers and other metal finishers.

Arthur W. Kurz Jr. has resigned as general manager and vice president of Manufacturers Plating Corporation, and Accessories Manufacturing Corporation, to take a position as works manager of Advance Plating Company, Inc. of Detroit—subsidiary of Aluminum Industries of Cincinnati, Ohio.

Hanson-Van Winkle-Munning Co. has announced the appointment of **Russell E. Davis** as a sales representative for the company in the Los Angeles, Calif., area.

With twenty-five years of sales and engineering experience, Davis will represent H-VW-M in the sale of the company's metal finishing equipment, supplies and processes. He will work under the general

Sulfur: less than 1 part per million

in KOPPERS POTASSIUM CYANIDE SOLUTION

Sulfur is the culprit in cyanide plating. And in some solid types of potassium cyanide, sulfur content *can be in the hundreds* of parts per million.

Koppers KCN solution, on the other hand, has *less than one part* per million. As a result, you get brighter finishes and *fewer rejects* when you use Koppers KCN solution.

OTHER ADVANTAGES OF KOPPERS KCN SOLUTION include easier and *safer* handling. Send for free descriptive bulletin which contains complete facts. Or call any Koppers Sales Office. Koppers Company, Inc., Dept. P-126, Chemical Division, Pittsburgh 19, Pennsylvania.

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KOPPERS CHEMICALS

Sales Offices: PITTSBURGH · NEW YORK · BOSTON · PHILADELPHIA · ATLANTA · CHICAGO · DETROIT · HOUSTON · LOS ANGELES · SAN FRANCISCO

In Canada: Dominion Anilines and Chemicals Ltd., Toronto, Ontario

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 1215.

PERSONALS

Davis

Hartley

direction of **Harold R. Smallman,** district manager of the Los Angeles office and an assistant vice president of the company.

Davis was self-employed as a mechanical contractor from 1931 to 1937, then joined Hussman Refrigerator Co. of St. Louis. He served with this company from 1937 to 1946 as a field representative, then as the company's chief development and test engineer. In this latter capacity he was responsible for new product design, material testing, product and process testing.

He became a manufacturers' representative in 1948, selling heat transfer equipment for industrial and metal finishing process applications in the St. Louis area.

He is a graduate of St. Louis University School of Commerce and Finance, where he received his degree in Business Administration. He also studied mechanical, industrial and electrical engineering at Washington University, St. Louis. He is a Registered Professional Engineer in Missouri (1946).

George M. Hartley, for the past 4 years sales manager of General Electric's chemical materials department, Schenectady, N. Y., has been appointed manager of marketing for the company's Metallurgical Products Department, Detroit, **K. R. Beardslee,** general manager, has announced. He succeeds **J. E. Weldy,** who recently was appointed a marketing consultant for the company's Marketing Services Division, New York.

A native New Yorker, Hartley joined General Electric in 1946, following service in the U. S. Navy as a lieutenant during World War II. While with the company he served in various functions, including market research, advertising and sales promotion, employee and community relations and materials engineering. He was plant manager of the Schenectady Chemical Materials Department plant, prior to becoming sales manager.

C. Brooks Ricca has been named Philadelphia district sales manager for Pennsalt Chemicals' Metal Processing Products, and **James Carlin** has been assigned to the field sales staff, department manager **John M. Davidson** has announced.

A graduate of Villanova University, Ricca has been a Pennsalt representative since 1950 handling sales of its metal cleaners, FOS coatings and cold forming lubricants for the metal processing industry in New York, Northern New Jersey, Pittsburgh and in the Philadelphia area prior to his promotion.

Carlin was educated at Drexel Institute and has been a member of Pennsalt's Metal Processing Products staff since 1947. He was assistant to the manager of sales prior to his present assignment.

The promotion of **Robert Stoulil** to superintendent of the plating department of the Maytag company here has been announced by **George Alward,** general superintendent of production at Maytag's Plant 2.

Stoulil started work at Maytag in the plating department in 1945 and was made a foreman in 1951. He became general foreman of the department in November, 1955.

Guy A. Cummings, metal finishing sales manager, Frederic B. Stevens, Inc., Detroit, has announced the appointment of **Roger J. Brown** as metal finishing sales engineer for the western New York district. Brown will operate from the Stevens Buffalo office and handle the company's metal finishing accounts in western New York and sections of northwestern Pennsylvania.

Prior to his appointment to the Buffalo office, Brown was employed for nine years in the Sales Department of the Detroit office serving in the combined capacity of Production Control and Coordinator of Sales, Engineering and Manufacturing operations of all manufactured equipment. His intimate association with all engineering and operational phases of plating equipment and service problems makes him extraordinarily well equipped to service any plating room problem.

Prior to joining Stevens, Brown was employed by Long Mfg. Div., Borg Warner Corporation, and served with the Army Air Force in the Pacific during World War II.

At the close of another year we realize how important your friendship and good-will have been to our success. We appreciate this opportunity to express our gratitude and wish you a very

Merry Christmas

AND A HAPPY, PROSPEROUS NEW YEAR

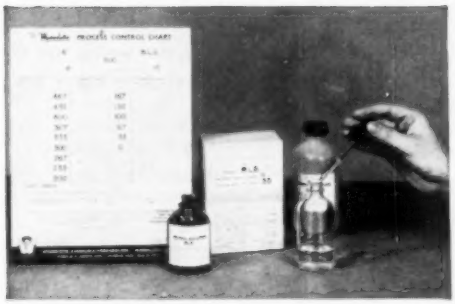
PROMAT A DIVISION OF **POOR & CO.**
851 S. MARKET STREET • WAUKEGAN, ILLINOIS
"PROMAT MEANS PROTECTIVE MATERIALS"

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 1216.

1. Technical Service — Factory-trained representatives, quickly available when needed; backed by factory specialists for a prompt solution to your problem . . . and kept up to date on latest metal-finishing practices.

2. Research — Extensive, modern facilities, including: pilot multi-stage spray washer, complete pilot-plating line, nuclear studies for Cleaner Research (in which we have pioneered). All staffed with experts — the best in the industry!

Try Wyandotte's winning combination!



3. Service Aids—Technically correct instruction sheets, control charts, testing equipment furnished without additional charge.

4. Background — Over 50 years' experience in specialized chemicals assures you of the best products, methods.

When you buy from Wyandotte, you not only get the finest in chemical products, but many other extra benefits, as well!

You get Wyandotte's capable technical service, extensive research, helpful service aids, and vast experience in metal finishing — a combination that means better results at lower cost for you. Contact us today! *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.*

WHY DON'T YOU, TOO, TRY WYANDOTTE FOR:

• Metal Cleaners • Paint-Preparation Products • Barrel-Finishing Compounds • Paint Removers • Aluminum Specialty Products • Neutralizers • Rust and Scale Removers • Rust Preventatives

Wyandotte CHEMICALS

J. B. FORD DIVISION

THE BEST IN CHEMICAL PRODUCTS FOR METAL FINISHING

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L—1200. Overhead Conveyor—A quality, low cost overhead conveyor is described in a new, 4-page bulletin recently prepared by Chainveyor Corporation.

The bulletin lists a number of the more unique features of the lightweight and flexible conveyor, and also illustrates a number of its uses.

E—1201. Analyses for Solutions—A new 36-page, two-color bulletin, "Simple Methods for Analyzing Plating Solutions" is now offered by Hanson-Van Winkle-Munning Co.

The bulletin is prefaced by a discussion of analytical principles, use of apparatus and methods for sampling a plating solution. It then outlines in detail the necessary steps involved in 28 analytical methods for testing nickel, copper, silver and other metalfinishing solutions.

Other sections of the bulletin describe necessary equipment, component chemicals of solutions, atomic weights, acid concentrations and electrochemical data. Conversion tables are included. Analytical reagents are listed for brass, cadmium, chromic acid, copper cyanide and sulfate, gold, nickel, silver, tin and zinc plating solutions.

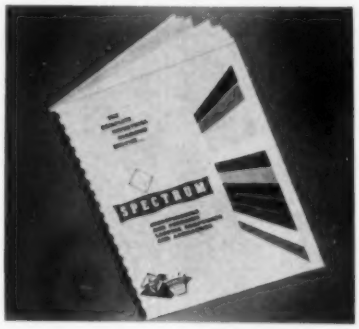
Five photographs of H-VW-M's laboratory at Matawan illustrate different test operations performed there.

L—1202. Multiple-Head Belt Grinders—This 4-page bulletin describes various models of new multiple-head abrasive belt grinders, manufactured by Engelberg Huller Company.

Illustrated machines are designed for high-volume flat surfacing of ferrous and non-ferrous metals, plastics and other materials. These conveyor-type models produce fine finishes to exacting tolerances, and make possible a single-cycle operation from rough grind to final polish.

Included in the two-color bulletin are: photographs, with complete specifications, of one-, two-, four-, and five-head models; two-side model for high speed surfacing of both sides of flat parts; production and operational photos; and illustrations of processed parts, with data on abrasive belts, tolerances, and production rates.

L—1203. Precision Lapping Manual—A new, 28 page, multi-color manual, "The Technology of Precision Lapping" illustrates and describes the use of fine diamond abrasives and the accessories required for their use in the new science of precision lapping and fine micro-finishing with precision graded diamond abrasives, as developed by Penn Scientific Products Co.



The new manual tells how to improve production by obtaining proper lapped finished surfaces for cutting tools, dies, gauges, precision wear parts, etc. The pure, precision graded, fine diamond powders, prepared in scientifically controlled compound form, are illustrated and described as well as the safe, economical, non-waste cartridge, tube, stick and jar dispensers. Also, the 12 standard grit sizes, color identified and called Spectrum diamond lapping compounds, are described and are said to insure the selection of the proper grit to start with and the necessary sequence of grits to follow to produce satisfactory predetermined known end results. Procedures for obtaining surface finishes accurately to less than one millionth of an inch are shown.

L—1204. Plating Waste Disposal—A 4-page illustrated reprint, "Precipitation and Filtration, a Practical Solution to Your Plating Waste Disposal Problems" is available from Filtration Engineers, Inc.

The literature compares various methods of waste disposal and discusses methods of handling waste from a typical plating operation. Filtration equipment, filter sizing and costs also are discussed.

L—1205. Dry Acid Replacement Salt—A new dry powder material that replaces liquid muriatic and sulfuric acid is fully described in Technical Data Sheet No. 43, a 2-page usage and instruction sheet prepared by Mac Dermid Incorporated. Named Metex Acid Salt M-629, this new dry acid replacement salt is packed and shipped in fiber drums. It is used in solution for acid dipping and pickling ferrous and non-ferrous base metals.

L—1206. Portable Glassware Washer—Data sheet describes Arthur S. LaPine & Company's new portable washer that cleans many different sizes and shapes of bottles, test tubes, flasks, burettes, and other glassware.

L—1207. Automatic Boilers—A new, 4-page, illustrated bulletin, describing Power-Pak packaged automatic boilers for steam or hot water heating and hot water service, is published by Orr & Sembower, Inc. The recently-introduced Power-Pak, available in capacities from 8 to 25 hp, for pressures up to 15 psi, is integrally equipped with either oil or gas firing burners—all completely designed, constructed, fire-tested, insulated, and guaranteed by the manufacturer. It is recommended for heating and low pressure process applications in industrial plants.

This two-color Power-Pak bulletin provides detailed illustrations of both oil and gas-fired units, indicating front and rear views.

L—1208. Anti-Seize Compound—The use of fluid Teflon as a thread-sealing and anti-seize compound for metal, plastic, carbon and ceramic systems and equipment, is described in a new bulletin offered by Eco Engineering Company. Included are typical applications for fluid Teflon, designated as Eco T-film.

A discussion of T-film threaded joints points out the advantages and cost savings to be gained as compared to the use of flanged fittings and weldments in many types of installations.

L—1209. Flexible Plastic Tubing—A new manual, Tygon Flexible Plastic Tubing, Bulletin T-97, is published by The U. S. Stoneware Co. This 28-page booklet covers each of the many Tygon tubing formulations individually and in technical detail. Applications and limitations of each formulation are presented fully. Physical properties and chemical resistances based on ASTM testing methods are presented in chart and table form. Each chapter includes photographic illustrations of actual applications.

Included are chapters on: laboratory tubing; semi-rigid, general utility chemical hose; flexible chemical hose; flexible low temperature tubing; vacuum tubing; cleaning methods including steam sterilization; special formulations, and fittings. Sixty-three bore and wall size combinations, available lengths and packaging data are presented in table form.

L—1210. Precision Metal Finishing—To help keep those responsible for precision metal finishing abreast of modern techniques, developments in electroplating, and to put additional emphasis on the importance of accuracy, The Summit Finishing Company has published "Industrial Precision Electroplating," a library-size bulletin.

The bulletin, prepared in "Life" magazine style with twenty large photographs and short informative descriptions, begins

Another Richardson Allen Engineering "First"

Demonstrating the same unsurpassed initiative, ingenuity and craftsmanship which, over the years, have set the pace of progress for the entire industry. Richardson-Allen engineers—working in close cooperation with Westinghouse engineers—have developed and perfected the ultimate in power rectification.

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DEPENDABLE POWER RECTIFIERS

HERMETICALLY SEALED JUNCTIONS—HIGH TEMPERATURE OPERATIONS

VERSATILITY—Richardson-Allen silicon rectifiers are now available for the plating and industrial fields in ratings up to 500 kws.

EFFICIENCY—Richardson-Allen silicon rectifier units are now supplying major industries with an unprecedented amount of direct current—with no loss in efficiency, no aging and no apparent limit to the life of the silicon junctions. Single silicon junctions are designed to withstand up to 300 vpi.

ECONOMY – Occupying unbelievable small space, the initial cost is often lower than other conversion methods; practically no maintenance is ever needed and when installation savings and power savings are figured the total amount is impressive.

For additional information, write to:

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IN CANADA: Richardson-Allen of Canada, Ltd., 1236 Birchmount Rd., Scarborough, Ontario

by presenting the Summit organization including engineering and planning methods, service efficiency, laboratory, general production facilities, special production equipment, inspection, quality control, and pickup and delivery service. This is followed with an outline of the growth and advancements of metal finishing and Summit's contributions to the industry.

The metal finishing requirements of specific industries: electronics, electrical, aircraft, and bearing have been given special attention in the bulletin, and a list of Federal specifications for which The Summit Finishing Company is approved is also included.

L—1211. Filter Presses—Brosites Products Corporation has just issued a new illustrated bulletin giving the latest information on their vertical plate and frame liquid clarifying filters. These units are designed for filtering plating solutions, varnishes, lacquers, or solvents.

This 4-page bulletin lists advantages of vertical plate design, gives operating procedures, has engineering data, a specification table, and illustrative diagrams.

L—1212. Chemical Applications—"A Guide to Sources and Applications of Molybdenum Chemicals," a new 4-page bulletin has been issued by Climax Molybdenum Company. The bulletin presents information which will help industrial users to select the most economical and convenient starting materials for current molybdenum chemical applications. These include catalysts, pigments, metal treating compounds, and analytical reagents.

A chart shows high-tonnage molybdenum chemicals produced and supplied by Climax, together with other compounds made by chemical manufacturers from some of these materials. The end-use industries of these molybdenum chemicals are indicated. A listing of selected technical bulletins on the uses and properties of molybdenum chemicals is also included.

L—1213. Welding—A new manual of practical welding knowhow published by All-State Welding Alloys Co., Inc. includes all methods of metal joinery usual to the welding shop plus cutting without oxygen. It covers work on aluminum and aluminum alloys (including joining aluminum to dissimilar metals), cast iron, copper and copper-bearing alloys, magnesium, monel, nickel, stainless steel, steel, and zinc-base die cast.

L—1214. Agitator Data Sheet—A new data sheet picturing the Technic Turbomatic Agitator, with specifications, is available.

Specifically designed for effectively agitating all precious metal electroplating solutions, the Turbomatic agitator does away with the need for stirrers, rod agitators and external pumps. It is reported to afford vigorous but smooth agitation not heretofore available.

Technic Turbomatic agitator Model GTA-40, illustrated in the data sheet, has a submerged positive displacement pump rated at 150 gallons per hour. Submerged parts are constructed of Teflon Bolderon Lucite and stainless steel. The complete unit is clamped to the side of the tank by an adjustable thumb screw, no other fastening being required. Model GTA-40 is designed for use in a tank 24" long and up to 24" in depth, models of similar design being available for use with tanks of other dimensions.

L—1215. Cleaning Compounds—New 8-page bulletin discusses Brulin's complete line of industrial cleaning compounds and solvents. Illustrated with photographs, this bulletin gives detailed information and applications of chemicals for industrial cleaning requirements. Ranging through the various cleaners and degreasers are the following:

PHELPS DODGE REFINING CORP.

Serves the Plating Industry with:

TRIANGLE BRAND

COPPER SULPHATE

TRIANGLE BRAND

NICKEL SULPHATE

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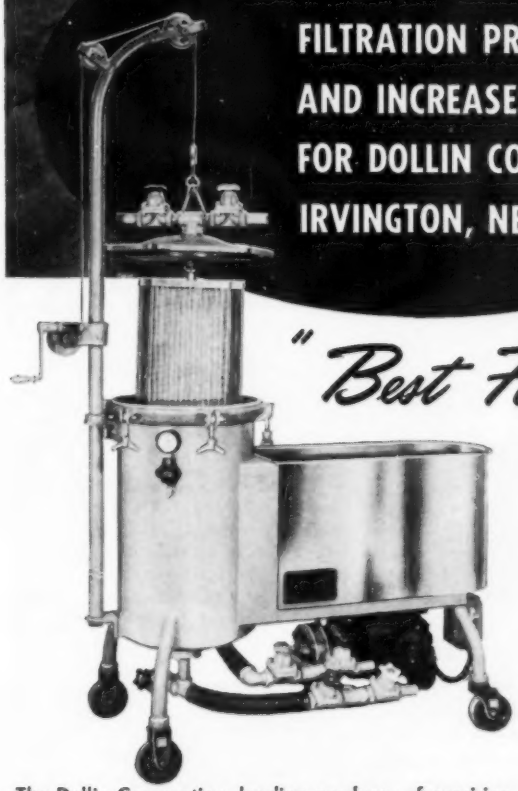
Sel-Rex SOLVES FILTRATION PROBLEM AND INCREASES PRODUCTION FOR DOLLIN CORPORATION, IRVINGTON, NEW JERSEY



"Best Filter on the Market..."

says Eric Reinhold
Chief Plant Engineer.

"Our Sel-Rex Filter removes foreign matter from the hydraulic fluid in our new die-casting machines— ***without interrupting production.*** *Not only do we get maximum efficiency from our costly equipment, but the reclamation of used hydraulic fluid to "like new" condition has already paid for our Sel-Rex. For my money, it's the best filter on the market."*

The Dollin Corporation, leading producer of precision die-castings, had frequent interruptions in production for filtering and replacing hydraulic fluid (viscosity—200) in their high speed die-casting machines. Their Sel-Rex Filter has eliminated this profit-eating downtime by doing the job *while their machines are in operation.* In addition, their Sel-Rex transfers hydraulic fluid from the barrel to the machines and back—as required. Like getting two machines for the price of one.

Whatever your liquid clarification or solids recovery problem, Sel-Rex—the fastest cleaning filter on the market—will increase your production, because you'll spend more time filtering, less time cleaning. Super-efficient filtration is assured by permanent, stainless steel mesh filter elements, attached to the easily removed tank cover for quick cleaning. No costly filter cartridges to replace.—*Dollin saves $15 per machine filtered on this feature alone.*

See for yourself why Sel-Rex assures better, faster, cost-cutting filtration. Send for your FREE copy of GUIDE TO BETTER FILTRATION, right now.

Space saving portable, mobile and stationary models from 250 to 18,000 GPH. Larger capacity models built to specifications.

NEMA

Sel-Rex Filter Division

BART-MESSING CORPORATION

155 MANCHESTER PLACE, Dept. PL-12 **NEWARK 4, N. J.**

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 1220.

Brulin's liquid Steam Charge for light and medium-duty steam cleaning; Brulinsolv, an emulsifiable liquid concentrate for cleaning and degreasing all metal and concrete surfaces; Brulin's rust and scale solvent for cleaning rust, scale and corrosion from aluminum, stainless steel and most other metals; and Brulin's Lume-Brite a specialized liquid cleaner designed to solve the most difficult cleaning of corrosion, pit marks and oxidation from aluminum.

Designed to replace toxic carbon tetrachloride and inflammable petroleum solvents, Brulin's Solvent Degreaser dissolves oily and greasy films. Water-soluble Safety-Solv is an all-purpose industrial degreaser used primarily for cleaning machinery and equipment; Multisol removes carbon and gum deposits from component parts of automobile, diesel and aircraft engines. Water-rinsable Flush-Off is a non-inflammable remover of paint, varnish and enamel from metal and concrete surfaces.

L—1216. Choosing Motors—Bulletin GED-2020B gives up-to-the-minute information on how to choose the correct General Electric fractional horsepower motor for shop jobs. The bulletin explains the terms horsepower, starting ability, shaft speed, and voltage. The pocket size booklet contains motor application and selection data for 50 typical applications. Various types of motors are illustrated, as well as the accessory cord and plug sets.

L—1217. Dust Collector—The subject of super cleaning ordinary atmospheric air by means of specially adapted industrial cloth-filter-type dust collectors is treated in a new bulletin just published by Wheelabrator Corporation.

Dealing with the Wheelabrator Ultrafiltration process, the bulletin has two case histories of installations where this process is used for cleaning dust out of the air.

L—1218. Descaling System—A bulletin describing various adaptations of the Kolene Corporation's system of descaling stainless, alloys and titanium after heat treating is now available.

L—1219. Flexible Polyethylene Pipe—Ace Supplex flexible polyethylene plastic pipe and fittings are described in Bulletin CE-57 recently issued by the Supplex Company, Division of American Hard Rubber Company.

Contents of the bulletin include: applications for Supplex pipe, sizes of standard pipe and fittings, installation instructions, technical properties, and estimated flow rates for water in various pipe sizes. Of particular interest to the industrial buyer is a chart which lists many common industrial liquids—acids, bases, organic chemicals, and so on—and specifies which of these liquids may be carried in Supplex piping.

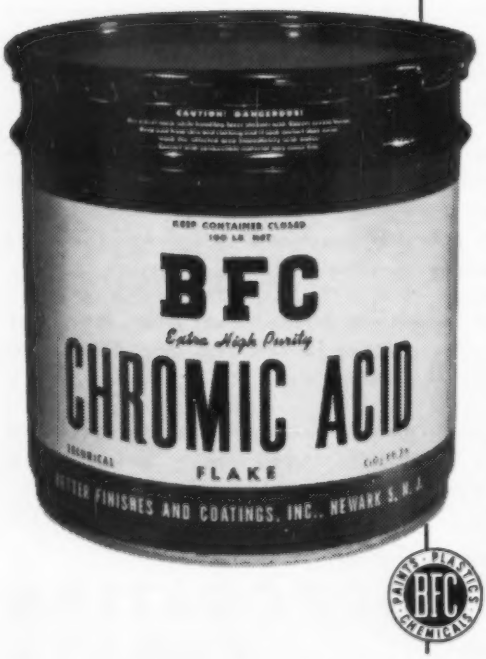
L—1220. Temperature Control—Data Sheet No. 5.5-1 describes the use of Honeywell instruments and controls to automatically maintain the desired boiling point and concentration of the solution used in the "Houghto-Black" coating process, developed by E. F. Houghton Company.

L—1221. Penetrant Inspection—"How to Perform Dye Penetrant Inspections" is the title of a new four-page folder issued recently by Turco Products, Inc., manufacturer of specialized industrial chemical processing compounds, and of Dy-Chek, the dye penetrant method of flaw location.

Written by William D. Briggs, manager of the 67-man Turco Technical Department, the semi-technical booklet is described as a "manual of established and proved rules" for performing inspections by the penetrant process, and is the first comprehensive report to be written on this vital subject.

The booklet thoroughly discusses every aspect of penetrant flaw location—precleaning, applying penetrant, removing excess penetrant, applying developer and interpreting results. Special emphasis is placed on the pre-cleaning step, and methods of removing all types of soil are thoroughly outlined. In addition, the booklet contains a valuable "dwell time" chart, which details recommended penetrating times for various types of materials and various types of suspected defects at various temperatures.

extra high quality
CrO_3
Every batch checked!
99.75% pure



It's a fact. We check the purity of *every batch* of BFC Chromic Acid by our own special test in a plant lab located only a hop-skip-and-a-jump away from the flakers. Not a drum moves from plant to warehouse until the lab says, "OK".

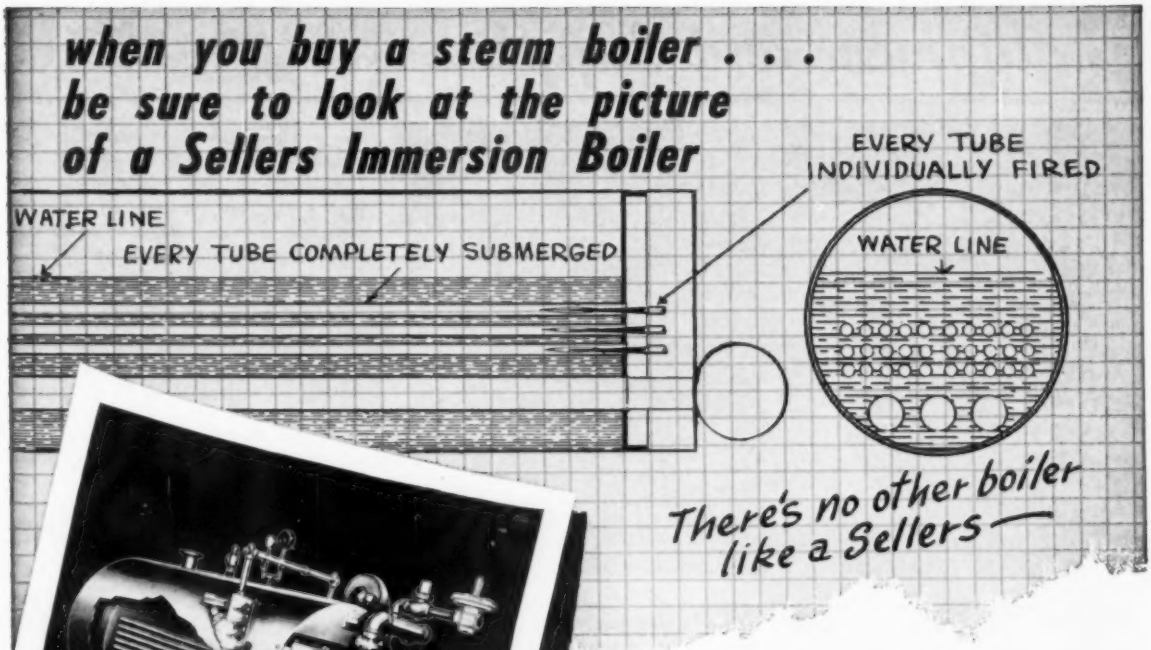
We don't know any better way than 100% check-testing to keep our quality up . . . and complaints down. Do you?

BETTER FINISHES & COATINGS, INC.

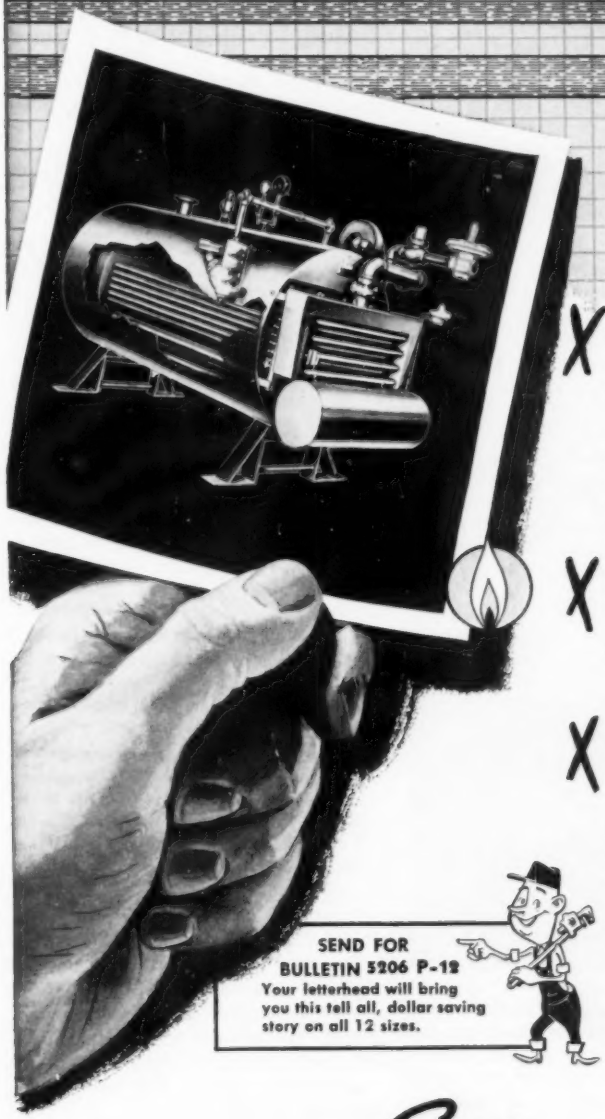
268 Doremus Avenue, Newark 5, N. J.

2014 East 15th Street, Los Angeles 21, Calif.

when you buy a steam boiler . . . be sure to look at the picture of a Sellers Immersion Boiler



There's no other boiler like a Sellers—



every square foot of heating surface is water backed— —100% effective!

The long, individually gas fired tubes in the Sellers Immersion Boiler are all completely submerged nearer the water level—and over the return tubes! Heat is therefore uniformly distributed through them—and directly into the water—no where else!

there's no scale problem!

In immersion heating, the needed long tubes expand and contract sufficiently on intermittent firing to crack loose any hard scale that forms on the tubes. This practically eliminates the scale problem, makes maintenance simpler and increases the boiler's efficiency.

the average flue gas travel is 15 feet!

Maximum, almost complete utilization of the exhaust heat is assured with a Sellers Immersion Boiler. This is a result of Sellers exclusive design—with the firing tubes completely submerged and *located over the return tubes,* there is a long, slow flue gas travel—an average of 15 feet! Heat can only go into the water.

There's no other steam boiler like a Sellers Immersion Steam Boiler. Its simple design gives you a package boiler unit with many other outstanding features. Minimum maintenance and maximum efficiency combine to give you years of remarkably low operating costs. Twelve sizes available!

SEND FOR BULLETIN 5206 P-12
Your letterhead will bring you this tell all, dollar saving story on all 12 sizes.

Sellers ENGINEERING CO.

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Blast Heaters • Immersion Automatic Water Heaters • Combustion Units • Industrial Gas Burners
Vertical Steam Boilers • Immersion Tank Heaters • Gas Combustion Equipment

Equipment and Supplies

Use the convenient Reader Service Card to obtain additional information on any of these items

E—1200. Aluminum Etchant—Newest addition to Wyandotte Chemicals line of metal and industrial cleaning materials is Mil-Etch. This caustic-type, non-dusty aluminum etchant suspends dissolved aluminum in solution eliminating scale build-up that must be chipped off on walls of tanks. It is claimed not to develop scale throughout the entire use cycle.

The new Wyandotte product produces a smooth, bright, satin finish surface and may be used for both regular and deep etching of all standard aluminum alloys. Work treated with Mil-Etch may be anodized if desired.

It is non-dusty—will not cake in the drum—and has good tank life—may be used until "loaded" with dissolved aluminum.

E—1201. Corrosive Resistant Pump—A pump wherein fluids handled are in contact only with Teflon or Kel-F is announced by Vanton Pump & Equipment Corp., Division of Cooper Alloy Corporation. The pump is designed for use with many extremely corrosive fluids, including those which could not be handled previously with other plastic or stainless steel materials of construction.

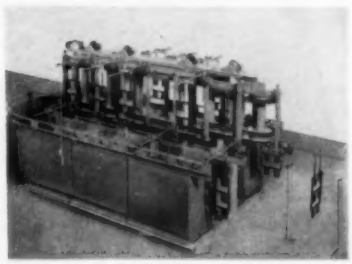
Since shaft seals and stuffing boxes are eliminated in the Vanton pump design, fluids or slurries are wholly isolated in a passage formed by the outer surface of the Kel-F liner and the inner surface of the Teflon or Kel-F body block. Operation of the pump is by means of an eccentric shaft and rotor assembly rotating within the liner and progressively pushing the fluid about its outer surface.

Teflon and Kel-F fluorocarbon materials have excellent resistance to corrosive fluids which include strong oxidizing acids, mineral acids, alkalies, aliphatic solvents and a number of chlorinated solvents.

Pumps are particularly suited for production line, pilot plant and laboratory use, and available with constant or variable speed electric or air motor drives. Capacities available to 5 gpm with pressures to 50 psi. Other plastic materials of construction available in sizes to 20 gpm.

E—1202. Rhodium Plate—A new rhodium plating process, which is said to produce compressively stressed deposits, eliminates curling, cracking and peeling common in conventional rhodium electroplate, according to Sel-Rex Precious Metals, Inc. Known as Rhodex-CS-(compressively stressed rhodium), the new process is expected to be of special interest to electrical and electronic manufacturers who have long been plagued with rejects of Rhodium plated components due to this metal's high tensile stress characteristics.

According to the manufacturer, the process has been subjected to extensive tests and experimentation. One of the most graphic of these tests entailed dissolving the basis metal from an object plated with conventional rhodium. In this instance, the rhodium disintegrated into small crystalline flakes, the edges curling away from the basis metal, demonstrating its inherent high tensile stress. When an object plated with Rhodex-CS-(compressively stressed rhodium) was subjected to the same test, it is reported that a continuous electroplated film remained, the edges curling toward the basis metal, indicating that the deposit was under compressive stress.



E—1203. Automatic Plating and Anodizing Machine—Lasalco, Inc., manufacturer of electroplating equipment, has a new, fully automatic plating and anodizing machine called the Cycleflex.

The Cycleflex eliminates the expense of overhauling or rebuilding during cycle changing. Only the positions of pick-up heads require changing, plus minor tank partition changes.

A simplified safety device and electromechanical control eliminate possibility of conveyor malfunction and make it impossible to push racks into side of tank, and prevents load from dropping if power fails during work transfer.

Other features include self-cleaning, heavy-duty contacts with positive 3-point contact; removable rack carriers that leave tank surfaces clear for easier servicing and manual plating of large pieces.

The Cycleflex can be equipped for automatic loading and unloading of parts from standard double-spine racks which can remain on machine while parts are unloaded.

E—1204. Stacking Baskets—For bulk parts handling, a standard line of stacking baskets is offered by Wire & Iron Products, Inc., under the trade name of Eezy-Stak.

Undoubtedly
THE ANODE SENSATION OF THE YEAR!

IN JUST ONE ORDER, 266 OF THESE 90"

COPPER CORE ANODES

World's Finest Chrome Plating Anodes

The same plater who recently gave us this order for 266 Copper Core Anodes has ordered a total of 400 so far this year. But this is typical of the keen reception these anodes have had with chrome platers, in both custom and company shops. Here are some of the reasons for their growing popularity:

The Copper Core is homogeneously bonded to the lead for its entire length. The hook is lead covered for additional protection.

This remarkable anode will conduct 250 amperes based on copper area alone. Natural current flow makes the entire surface self-cleaning—insuring complete saturation, instant current distribution, and unusual throwing power. This greatly reduces plating time for a given thickness of deposit.

The Copper Core distributes the current equally throughout the length of the anode. As this anode is insulated above and below the solution level, there is no flow of heavy surface currents nor burning off at solution line. Conductivity is uniform at all solution levels, regulated only by the cathode depth.

Because of the perfect contact maintained by a one-piece copper hook, Copper Core Anodes will not heat at point of contact, and there are no current failures to solution. Also, Copper Core Anodes do not warp out of shape.

GUARANTEED FOR 18 MONTHS

Following are the simple conditions:

For every month that our Copper Core Anodes fall short of 18 months service, they can be exchanged for new ones on an adjusted or pro rata basis.

All anodes in the tank must be Tramer Copper Core Anodes. They may not be used in proprietary solutions. The unsatisfactory Copper Core Anodes must be returned to us for credit.

Write Today for Prices

—which are temporarily at a very low point, and, when writing, tell us the number of anodes desired, and the tin-lead or antimony-lead percentage.

The GILBERT TRAMER *Co.*

POLISHING, PLATING, and CHEMICAL EQUIPMENT

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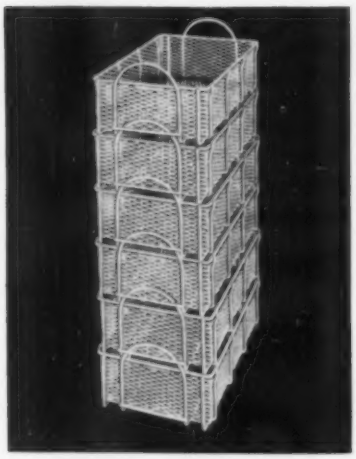


Fabricated of flat expanded metal (¼" or ½" on welded steel wire frames, the baskets are open mesh construction for quick drainage and easy cleaning. Zinc-plated, rust-resistant finish. Patented interlock handle provides safe, convenient stacking and compact parts storage. Inside dimensions are 12" x 20" x 5½".

E—1205. Conversion Coating—Lusteron 52 Powder is a low priced single dip, no leach conversion coating for zinc plated surfaces recently developed by The Chemical Corporation for automatic equipment where facilities are not available for added leaching and rinsing.

It gives a bright bluish hue; provides corrosion protection against staining, tarnishing and white powder products.

It can be used in cases where cost has prohibited use of chromates in the past; for instance, electrical conduit, conduit boxes, screws and builder's hardware, tools, electronic parts, air conditioning parts, automotive parts, cheap toys.

E—1206. Parts Handling Boxes—The Chas. Wm. Doepke Mfg. Co., Inc. has a complete new line of NesTier materials handling boxes. The new units are priced about one-third less than the firm's older "Heavy Duty" line, yet incorporate the same exclusive design features.

Of one-piece durable steel construction, the new units are available in five sizes ranging from 12 to 36 inches in length and will support stacked loads of from 300 to 1200 lbs. Differing from the "Heavy Duty" containers only in that they are fabricated of a lighter gauge metal and have no bottom runners, the new "General Purpose" boxes will fill most parts handling requirements.

The nesting-stacking feature and double hopper design of the new boxes permit handling parts throughout the plant in the same container, reducing handling and parts loss in storage, production and assembly.

E—1207. Brightening Powder—The Conversion Chemical Corporation has developed a revolutionary one-dip process with an easily handled powder to produce bright surfaces on zinc plated work with no brighteners in the zinc bath. The new powder, Kenvert 16, offers economies over previous methods, with savings up to 50 per cent possible. It is packaged in non-returnable drums of either fiber or steel with polyethylene envelope liners. The new process operates satisfactorily in the temperature range from 90 to 110 degrees with no ventilation required, and is said to offer excellent corrosion protection and unusual resistance to staining and fingerprints.

E—1208. Special Metallizing Gun—The new line of oxide coatings, developed by the Norton Company and known by the trade name Rokide, is being successfully applied to base metals and other materials by means of a specially designed

FORMAX

the Perfect Combination

FROM START TO FINISH

ZIPPO CLOTH BUFFS

These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.

BUFFING COMPOUNDS

Formax produces a complete line of buffing compounds in bar, tube and liquid form.

Our extensive manufacturing, laboratory and testing facilities are at your disposal.

ZIPPO SISAL BUFFS

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

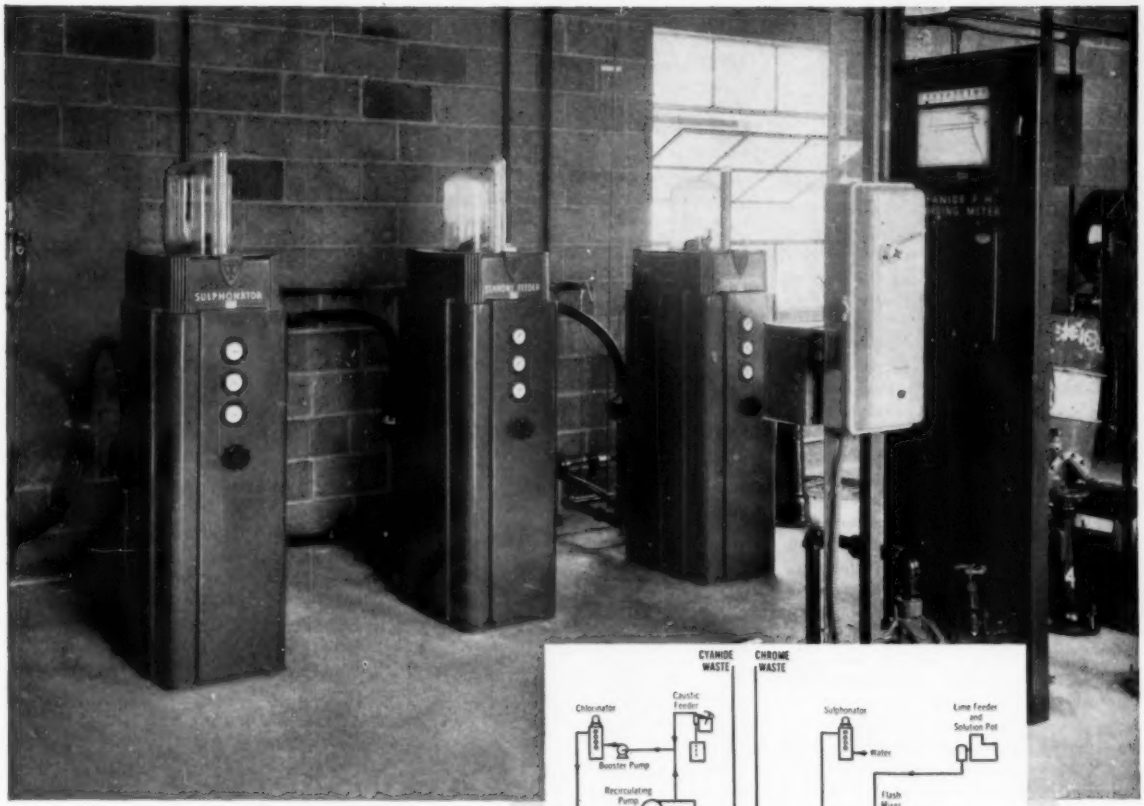
Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

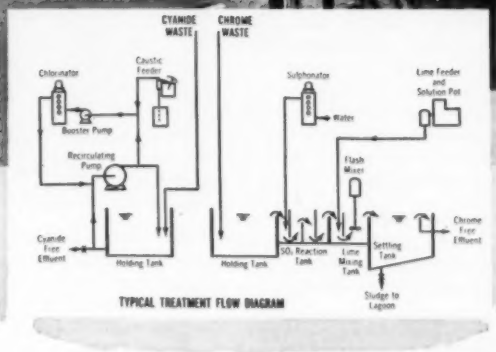
Descriptive Catalogs Sent on Request

FORMAX MFG. CORP.

DETROIT 7, MICHIGAN

"THE FOUR McALEERS"





DAYSTROM INSTRUMENT DIVISION USES

W&T *Cyanide & Chrome Waste Treatment*

The Daystrom Instrument Division of Daystrom, Incorporated, located at Archbald, Pennsylvania, has provided a compact and efficient treating plant to destroy the toxic components of their plating waste. The treatment plant has been in continuous operation since 1953.

The cyanide bearing waste is treated with chlorine and caustic, using a W&T Water Diaphragm Chlorinator and a W&T Chemical Solution Feeder. The treatment breaks down the cyanide to harmless carbon dioxide and nitrogen gas components.

The chromium bearing waste is treated with sulphur dioxide and lime, using a W&T Sulphonator and a W&T Dry Chemical Feeder. The treatment removes the toxic chromium and other heavy metals from solution, to be disposed of as sludge.

If you would like more information on Wallace & Tiernan cyanide or chromium waste treatment, write for bulletin RA-2120-CP.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

1-52

metallizing gun made by the Metallizing Company of America.

These new Rokide coatings are proving to be remarkably successful in protecting the underlying metals from abrasion and excessive heat when used in such applications as rockets, jet engines and guided missiles as well as a number of commercial applications. Early experimentations with these coatings in powder form showed good protection but lacked adherence to the base metals. This led to the development of materials in rod form that could be applied through the new Rokide Metallizing Gun, specially designed for this purpose. This new oxy-acetylene gun reduces the rod to molten particles at temperatures in excess of 5000° F and projects the molten particles at high velocity by compressed air onto the metal surface to be coated. The metal surface is previously roughened by grit blasting and the resultant bond shows good adherence. By its nature the coating is slightly porous in structure and in turn shows a surprising flexibility.

Both the Rokide coatings and the method of application are protected by Norton Company patents; however, in view of the importance of the coating to national defense work as well as for certain commercial applications, the Norton Company will license any company to use the coating on a non-exclusive basis.

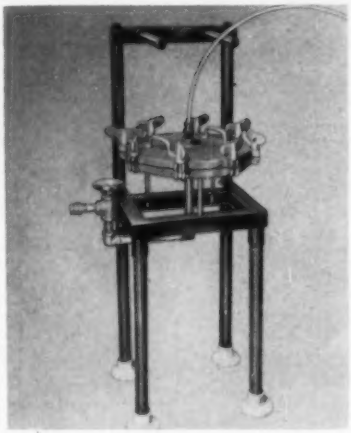
E—1209. Portable Projection Magnifier—A new low-cost contour and surface projector, Magnavisa, is announced by American Optical, Instrument Division.

Designed as a self-contained portable projection magnifier, it is ideally suited for efficient, fatigue-free inspection and examination of relatively flat objects and small parts, imprinted circuits, fine print of small scale drawings and like applications. Two models are available: one enlarges the original material three times; the other, five times. The AO Magnavisa can be used for prolonged periods, without eye strain, in any normally lighted area.

E—1210. Corrosion-Resistant Coating—A new vinyl maintenance coating—Ucilon Coating 1400—that provides the corrosion resistance of previous vinyl-based coatings, but eliminates strong odors and the need for meticulous surface preparation has been introduced by Metal & Thermit Corporation.

Ucilon 1400 resists acids, alkalies, water and other causes of early paint failure. It can be used for walls, floors, ceilings and the exteriors of equipment to resist corrosive fumes in chemical processing plants and other industrial atmospheres.

E—1211. New Submicron Filter—A new ultra-fine method of water filtration has been announced by the Barnstead Still & Demineralizer Company. The new Barnstead MF Submicron Filter is effective in filtering out particles as small as



.000016 inches, thus making it possible to eliminate production problems in the manufacture of transistors, charactron tubes, in reactors and their components, and other potential applications.

Where distillation and/or demineralization of water has still left engineers and chemists with unsolved problems of trace impurities, this filter may be effectively used.

Heretofore only minute quantities of such high purity water had been obtained through involved batch treatment in the laboratory. Barnstead MF submicron filters are manufactured in capacities of from 100 to 400 gallons per hour with even higher capacities possible when filter plates are arranged in parallel.

E—1212. Portable pH Recorder—Self-contained, portable pH measuring and recording instruments requiring no external power supply are now available for waste-treatment plant effluent, field surveys of stream pollution, and industrial water supplies, as well as in-plant studies at locations where a permanently mounted pH recorder is not desired for any reason, or where power is not available.

The new device consists of two units: a Bristol Model 524 pH recorder and a Beckman N-2 amplifier. This equipment will cover the total pH range of 0-14 in two partial ranges of 0-8 and 6-14.

E—1213. One-Spindle Polisher with Dust Collector—Producers of small metal parts which require polishing, instrument manufacturers, optical laboratories and others, are now offered an inexpensive polishing machine with the advantages of a dust-collector unit in the new Vu-Al one-spindle polisher. While the larger, two-spindle polishers may be required for heavy production work, especially where a variety of buffs and wheels must be used, the Vu-Al one-spindle polisher with dust collector is designed for steady use where few changes need be made in buffs and wheels.

Compact and made to fit on a bench or in any other small working space, this polisher measures 9 x 12 x 14 inches. Operating on 120 AC, it has a sturdy, 3450 rpm polishing motor and a separate dust-collector motor. Suction takes in all polishing dust, keeping the work area dust-free; where precious metals are being polished it collects and saves the dust to be reclaimed.

E—1214. Pressure Blast Unit—Another special tooling adaptation to one of its line of standard, manually operated units is announced by The Cro-Plate Co., Inc., manufacturers of the Pressure Blast line of wet blast machinery.

The usual armports are eliminated from the front of the equipment and a drawer-type slide substituted. The workpiece, in this case a steel roller bearing cage, is loaded on the slide at the outside and pushed through a baffled area into the interior. In that position, a variable speed drive mounted beneath is actuated and through a shaft connection rotates the roller cage at approximately 12-15 rpm.

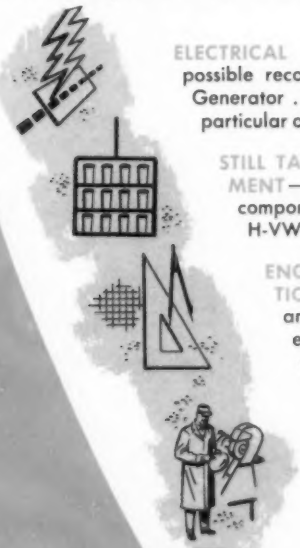
This particular unit was designed for the cleaning of roller cages prior to phosphate coating.

E—1215. Protective Coatings—The Carboline Company announces its new Carbomastic series of protective coatings. The Carbomastics are epoxytar coatings with solids content ranging from 85 per cent to 90 per cent and applying at thicknesses up to 10 mils per coat.

The Carbomastic coatings show resistance to water, high relative humidity, brine, refinery products, ultra violet light, hydrogen-sulfide gases and ammonia as well as other acids, salts and alkalies. Accelerated tests in hydrogen sulfide cabinets show an expected life of better than 13 years in protecting steel from sour crudes or high concentrations of hydrogen sulfide.

Aluminum
anodizing, buffing and cleaning

No matter what your aluminum finishing problem or need, you'll find the answer at H-VW-M . . . because it is the one company combining a complete engineering service with a complete line of equipment and supplies!



ELECTRICAL EQUIPMENT — Want the best possible recommendation of a Rectifier . . . Generator . . . or Control Equipment for your particular operations? Page 2 tells how to get it.

STILL TANK OR FULL AUTOMATIC EQUIPMENT — Whatever your need — from a single component to a complete, integrated system — H-VW-M supplies it . . . Page 3.

ENGINEERING SERVICE AND INSTALLATION — H-VW-M engineers and technicians are anodizing equipment specialists, with years of experience. Page 3 tells why these H-VW-M services mean greater efficiency and savings in your plant.

ALUMINUM FINISHING SUPPLIES — Page 4 shows how H-VW-M research has resulted in new compounds, improved buffs and cleaners to make aluminum finishing easier, better.

HANSON-VAN WINKLE-MUNNING CO. · MATAWAN, NEW JERSEY, U.S.A. ·

HANSON-VAN WINKLE-MUNNING COMPANY

MATAWAN, NEW JERSEY

Manufacturers of a complete line of electroplating and polishing processes, equipment and supplies

Plants: **Matawan, New Jersey • Grand Rapids, Michigan**

Sales Offices: Anderson (Ind.) • Baltimore • Beloit (Wisc.) • Boston • Bridgeport • Chicago Cleveland • Dayton • Detroit • Grand Rapids • Los Angeles • Louisville • Matawan Milwaukee • New York • Philadelphia • Pittsburgh • Plainfield (N. J.) • Rochester • St. Louis San Francisco • Springfield (Mass.) • Utica • Wallingford (Conn.)

These H-VW-M Anodizing and Finishing to New Savings, New Efficiency, New

ELECTRICAL EQUIPMENT

H-VW-M is the only manufacturer of both Germanium and Selenium Rectifiers *and* low voltage, direct current Motor Generator Sets for the metal finishing industry. This thorough experience in every phase of low voltage power generation and rectification means that when you bring your power problems to H-VW-M you're sure to get the perfect equipment recommendation.

Self-Contained Rectifier with Tap Switch Control

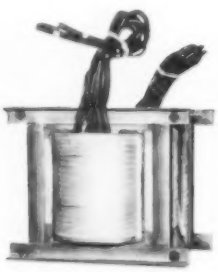
Remote Controlled Rectifier with Tap Switch Control

Germanium and Selenium Rectifiers . . . Rectifier Controls

Highest quality and efficiency, flexibility, economy and low maintenance are the characteristics combined in H-VW-M's full line of both Germanium and Selenium Rectifiers. 6 to 48 volt units—both remote and self-contained—provide the exact direct current low-voltage and high amperage required in aluminum anodizing. The widest possible choice of controls and control combinations is available. Such devices as manual or motor operated tap switch controls, continuously variable auto-transformers and saturable core reactors are used with or without supplemental controls to provide automatic voltage stabilization, automatic constant current as well as automatic programming.

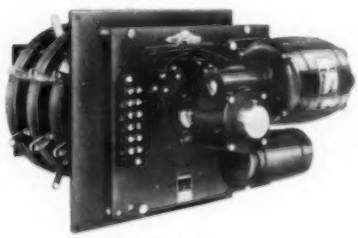
Write for Bulletin ER-108, which gives further information about Rectifiers and Controls, plus useful control application suggestions.

Manual Tap Switch Control



Saturable Core Reactor

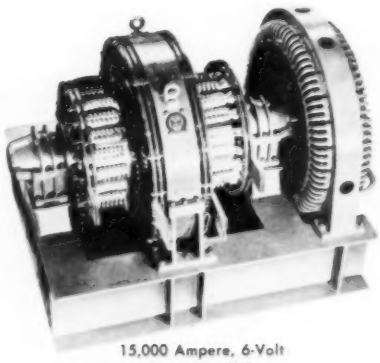
Continuously Variable Auto-Transformer



Motor Operated Tap Switch Control

Generators . . . and Controls

H-VW-M Motor Generators designed especially for metal finishing operations are built in sizes up to 50,000 amperes, and accessory equipment includes a full line of controls and control panels to cover any desired control function. Easy-to-maintain H-VW-M Motor Generators have exceptionally rugged and practical construction features insuring maximum performance and life. Standard voltage ratings range from 6 to 50 volts, and include the 18 and 24 volt units usually required for sulphuric acid anodizing, plus the 40 and 50 volt units used in chromic acid anodizing. Write today for 24-page Bulletin G-104, covering in detail all H-VW-M Generators.



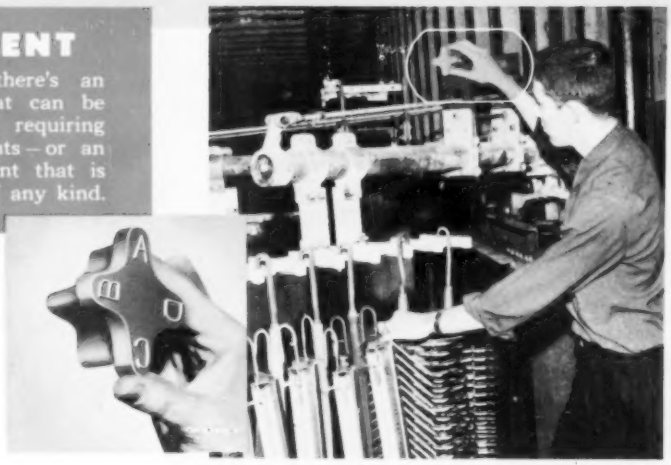
15,000 Ampere, 6-Volt Generator Unit

Automatic Anodizing Control Panel

Supplies, Equipment and Services Add Up Simplicity of Operation in Your Plant

PROCESSING EQUIPMENT

Whatever your anodizing procedure, there's an H-VW-M Full Automatic Conveyor that can be adapted to any production application requiring automatic cycling of individual treatments – or an H-VW-M Tank with accessory equipment that is perfectly adapted to still tank methods of any kind.



Workman "dials" desired cycle in refrigerator plant. Parts will by-pass or lower into baths as dial setting dictates.

Automation in Metalfinishing— *Full Automatic Conveyors with Dial-A-Cycle*

H-VW-M's new DIAL-A-CYCLE system automates nine or more complete metalfinishing processes on a single anodizing or electroplating machine. This revolutionary by-pass mechanism can be used on any metalfinishing installation for anodizing, electroplating, or similar processing. It is especially useful and effects substantial cost reductions when a variety of parts requires several different processes or colors.

DIAL-A-CYCLE, as the name implies, is controlled by a simple dial setting. The dial is mounted on the carrier arm that carries the parts through processing tanks. It is set by the machine operator for the processing steps through which each load of unfinished parts is to move. Automatic conveying then takes over, lowering the parts into the required tanks and bypassing others.

Different products, requiring different anodizing cycles, may be processed at the same time, with the same equipment. DIAL-A-CYCLE gives you new versatility while reducing operating, labor, and maintenance costs. Close, automatic control of transfer and immersion periods improves quality.

DIAL-A-CYCLE is the newest of many types of conveyors and equipment H-VW-M supplies to aluminum finishers. H-VW-M also design, manufactures, and installs return-type conveyors . . . elevator conveyors . . . straight-line conveyors . . . and others. For a complete description of all types, write for Bulletin FA-105.

Tanks and Equipment

At H-VW-M – the plating and anodizing industry's workshop—you'll find tank equipment for every phase of your work. For chromic acid anodizing, H-VW-M double electric welded unlined steel tanks are offered, along with steel coil equipment for cooling and heating. The entire system is H-VW-M designed, supplied and installed. For sulphuric acid anodizing, lead-lined steel tanks, plus the necessary cooling coils and air agitation assembly, are supplied. Tanks are fabricated from hot rolled steel, stainless steel, and aluminum. Other types of tanks are also available. Bulletin No. T-108 gives full particulars about this important H-VW-M equipment. Every conceivable type of auxiliary equipment is engineered and supplied, according to customers specifications, including a complete packaged refrigeration system for anodizing solutions.

And H-VW-M's Engineering and Installation Service

Anodizing problems of *any* kind? H-VW-M is prepared to set up your entire anodizing system from beginning to end—a system made up of components scientifically engineered to work together with utmost efficiency. Because of this, and because of H-VW-M's continuing research and development in every aspect of the anodizing picture, you can be confident that the recommendation you receive from H-VW-M is the very *best*.

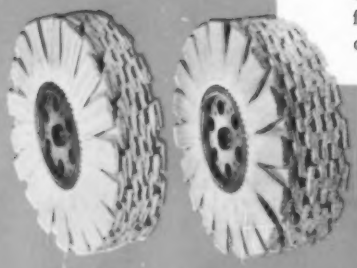
What's more, if requested, H-VW-M sees to it that the equipment you buy is H-VW-M *installed*. This means perfect, efficient operation from the start.

Add to this the fact that an H-VW-M technical representative—ready to serve you—is no further than your telephone. These representatives serve in principal cities across the nation. Get to know the one nearest you. He can help you get the most from your aluminum finishing equipment and supplies.

TURN THE PAGE FOR ALUMINUM BUFFING AND CLEANING SUPPLIES

ALUMINUM BUFFING AND CLEANING SUPPLIES

Since aluminum came into its own after World War II, considerable H-VW-M research and development work has been devoted to the perfection of buffs and compounds suiting the unique physical characteristics of this popular light metal. When long-wearing H-VW-M Buffs are used in conjunction with H-VW-M compounds especially formulated for aluminum finishing, you have the perfectly balanced combination for economy, efficiency and quality performance.



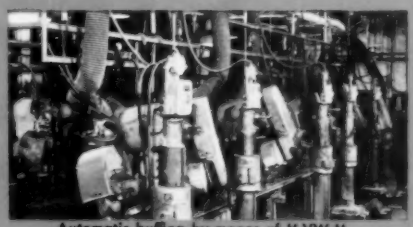
Buffs

Nowhere will you find a wider selection of the buffs you need for preanodizing operations than at H-VW-M. Whether you're looking for a super-heavy-duty buff like new steel-centered Ruff-L-Buffs (which are available untreated, or Binderized® for extra long wear) medium duty buffs like Triplex Buffs, or a buff for medium-to-light service such as the Full Disc Buff, you need look no further than H-VW-M. The full H-VW-M line also includes new Tufta-Flex Buffs (cloth tufts) and Sisal-Flex Buffs (with sisal-centered tufts).

Among this array you'll find the exact buffs for your aluminum finishing needs. Every one is characterized by first quality, uniform new material of close weave and good weight . . . tight sewing with heavy thread . . . and proper balance. Write for 12 page Bulletin B-103, which describes H-VW-M's entire buff line.

Compounds

Hand buffing using H-VW-M buffs, compounds.



Automatic buffing by means of H-VW-M Liquimatic System.

For heavy duty cutting, H-VW-M Liquid Tripoli Compounds 303 and 420 were developed, and are now widely used in the cooking utensil industry. For the appliance, storm window, construction materials and automotive fields, H-VW-M's new Liquimatic Liquid Compound No. 728 has proved especially successful, giving excellent cut, while leaving the surface with deep, high color.

H-VW-M Bar Compounds also find broad use in aluminum finishing. A variety of tripoli bar compounds are offered in varying consistencies to meet all cutting requirements. For cut and color, special white compounds are available. And for high color, several new H-VW-M aluminum oxide compounds—No.'s 6-B-168, 6-B-72 and 8390—give unusually good results. Write for Bulletin CO-103.

Cleaners

H-VW-M devotes constant research to the subject of cleaners in its search for ever better products in the aluminum finishing field.

Matawan Cleaners are designed specifically to give superior results in soak cleaning, power spray operations, oxide removal, and for special aluminum cleaning and etching operations. Of particular interest is H-VW-M's 85S Cleaner, which prevents scale formation, thus keeping coil and tank walls scale free. This unusual aluminum cleaner leaves an extremely bright surface, and, because of its built-in regenerator, makes maximum effective use of caustic in the bath.

In line with its desire to supply the exact cleaner for the job, H-VW-M offers its extensive laboratory facilities where circumstances demand a special cleaner.

When you think of aluminum finishing equipment and supplies—think of H-VW-M first. Buying from one dependable source . . . H-VW-M . . . means one company assumes full responsibility—your guarantee that you're getting the best . . . in products . . . in performance, in *extra* service.

PLATEMANSHIP

Your H-VW-M combination — of the most modern testing and development laboratory — of over 80 years experience in every phase of plating and polishing — of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING COMPANY, MATAWAN, N. J.

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H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

Printed in U.S.A.

LABORATORY CONTROL OF COLOR ANODIZING PROCESS

by Frank P. Stiller*

ALTHOUGH THE COLOR ANODIZING PROCESS is quite simple, a certain amount of control over the various steps in the processing cycle is required if reproducible results are to be obtained.

There are two major variables affecting the ultimate color obtained in this process.

I. *Factors affecting the thickness and porosity of the aluminum oxide film as it is being formed.* Because the time of anodizing, the applied voltage, and the electrolyte temperature can be controlled physically, there is but one chemical analysis to be made, that of the electrolyte. By making this analysis a daily routine and keeping the effective acid concentration of the anodizing electrolyte constant, one may be sure that the electrochemical reaction in the anodizing tank is proceeding at a constant rate.

The concentration of the electrolyte is determined quite easily by making two titrations with sodium hydroxide. In one, the aluminum present in the bath is prevented from taking part in the reaction by the addition of potassium fluoride. A second titration, without the fluoride, enables the calculation of the amount of aluminum present.

The aluminum content of the solution is of value for two reasons: a. It has been determined experimentally that approximately 20 per cent of the aluminum sulfate serves, in effect, as sulfuric acid. The effective acid thus consists of the free sulfuric acid plus 20 per cent of the aluminum sulfate calculated as sulfuric acid. This combination must be kept at the controlled value. b. As this aluminum content approaches 20 grams/liter, aluminum sulfate starts to precipitate on the tank walls and work. Therefore, when this value reaches 15 grams/liter, it is best to discard the solution.

II. *Other factors affecting the shade of the finished work* are physical or chemical changes in the condition of the dyebath. Here we are dealing with a complicated organic compound; chemical analysis is impractical if not impossible. Control is attained by maintaining the solution at a predetermined pH value for each dyeing and by checking the strength and shade of the resultant dyeings against previously prepared standards.

It is possible to check the concentration and composition of the dye solution by comparing a diluted sample of the working bath with a freshly prepared, diluted sample of the original dye mixture. However, this method is more academic than practical. Impurities in the water, salts that are introduced by drag-in, and other foreign matter are not absorbed by the anodic coating. As time passes they become more concentrated and cause variations in the shade. Consequently, comparison of actual dyeings is the most practical method for plant use.

ANALYTICAL PROCEDURES

Sampling Technique

In order to obtain a representative specimen, tanks should be at the correct operating level and contents thoroughly agitated before sampling. With large volume solutions several specimens must be taken from different locations in the tank and combined to form the final test sample. A long sampling tube should be used to obtain specimens from different levels of the tank. Sample bottles should be stoppered immediately, since the vapors present in the atmosphere of the anodizing room can quickly affect the pH values of the sample solutions.

Analysis of the Sulfuric Acid Anodizing Bath

Reagents required:

Standard sodium hydroxide solution 1.00 normal.

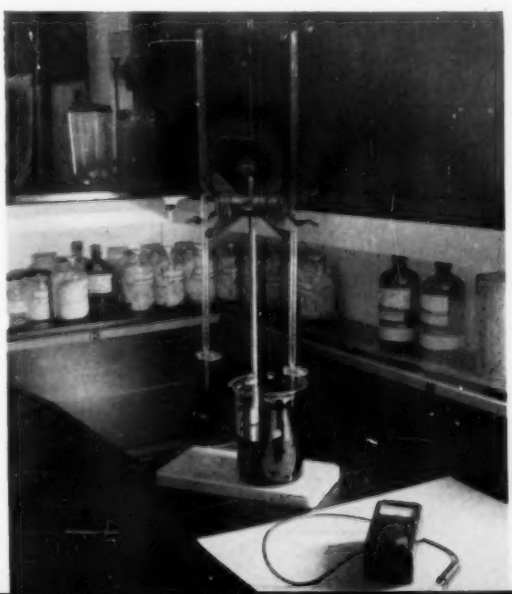
Potassium fluoride solution prepared as follows:

Dissolve 50 grams of $KF.2\,H_2O$ in 100 ml of water. Add a few drops of phenolphthalein indicator and neutralize. This solution should be stored in a polyethylene or paraffin lined bottle.

Procedure:

Using a pipette, transfer 10 ml of the anodizing solution into each of two 250 ml Ehrlenmeyer flasks. Dilute each

Equipment used for pH control of dye solutions.



*Aluminum Dye Application and Research Laboratory, Sandoz Chemical Works, Inc., New York 13, N. Y.

Raising the pH of a 1 liter sample of the dye solution by the addition of sodium hydroxide.

to about 150 ml and add a few drops of phenolphthalein indicator.

Titrate one sample, with agitation, to a pink end point with the standard sodium hydroxide solution. Record this titration volume in milliliters as X.

Titrate the second sample slowly until the aluminum hydroxide that forms is only slowly redissolved. Add 20 ml of the potassium fluoride solution and continue the titration until the end point remains pink for 2 minutes. Record the volume of sodium hydroxide required as Y.

Calculations:

Aluminum content in grams/liter = (X − Y) (N) (0.9) where N = the normality of NaOH used

Free H_2SO_4 (100 per cent) in grams/liter = (Y) (N) (4.9)

Effective H_2SO_4 (100 per cent) content in grams/liter = $(C_1) + [.20(X - Y)\ (4.9)]$ where C_1 is the H_2SO_4 (100 per cent) content

Technician preparing the equipment for analysis of the sulfuric acid anodizing solution.

The following table shows the equivalent concentration in grams/liter, per cent by weight, and pounds per gallon:

Grams/Liter	Per cent by Weight	Pounds/Gallon
106.6	10	0.8897
118.0	11	0.9851
129.6	12	1.082
141.4	13	1.180
153.3	14	1.279
165.3	15	1.379
177.5	16	1.481
189.9	17	1.584
202.4	18	1.689
215.0	19	1.795
227.9	20	1.902

The approximate tank addition is calculated by use of the following equation:

$$\text{Technical sulfuric acid pounds required} = \frac{[C_r - C_e]\ 100T}{C_a}$$

Where:

C_r = required concentration in pounds/gallon

C_e = the effective acid concentration in pounds/gallon obtained by analysis

T = capacity of anodizing tank in gallons

C_a = concentration of the sulfuric acid used for the addition in per cent H_2SO_4 by weight (Note: 66.0° Bé sulfuric acid contains 93.2 per cent by weight H_2SO_4 (100 per cent) and weighs 15.31 pounds per gallon.)

pH Control of Dye Solutions

Whenever a new dye bath is made up, the pH should be adjusted to the proper value by the addition of small amounts of acetic acid or sodium hydroxide. The pH value of the solutions must be determined by means of an electrometric pH meter since the color of the dye prevents any analysis by colorimetric methods. In addition to the pH meter, 0.1 normal standardized solutions of acetic acid and sodium hydroxide are required.

Procedure:

Immerse the electrode of the pH meter in a 1000 ml sample of the dye solution taken from the tank. Using either the acid or base as required, titrate this sample with agitation, until the proper pH value is attained.

Calculations:

For raising the pH:

tank addition in grams of 97 per cent sodium hydroxide = $(V_b)\ (0.01565)\ (T)$

Where:

V_b is the volume in milliliters of 0.1 normal sodium hydroxide required to titrate the sample

T is the tank capacity in gallons

For lowering the pH:

tank addition in ml of glacial (99.5 per cent) acetic acid = $(V_a)\ (0.02404)\ (T)$

Where:
V_a is the volume in milliliters of 0.1 normal acetic acid required to titrate the sample
T is the tank capacity in gallons

Dye Concentration

The following method may be used to check the dye concentration in standing baths. However, as previously mentioned, a more precise method is by comparing actual dyeings on aluminum with dyeings colored with freshly made, standard dye solutions.

Dilute a 10 ml sample of the working dye solution to 500 ml in a volumetric flask. (For highly concentrated solutions such as black, a 5 ml sample may be necessary.) After filtering, place 25 ml of this solution in a 50 ml comparison tube and compare with a freshly made equally diluted, standard dye solution. The depth of color in the two tubes is compared by viewing against a white background and the standard dye solution diluted further with distilled water until both appear to be at the same concentration. The concentration of dye in the sample being checked in oz/gal $= \frac{(25\ C_s)}{V}$

Where:
C_s is the concentration of dye in standard in oz/gal
V is the final volume of standard solution in ml
The necessary tank addition is then equal to:
$(C_r - C)\ (T)$

Where:
C_r is the required concentration in oz/gal
C is the actual concentration in oz/gal
T is the tank capacity in gallons

Sealing Bath Control

Control of the nickel acetate concentration and the pH of the sealing bath is practiced in some operations. However, the complete analysis usually is not essential and since this procedure is time consuming, periodic replacement of the entire bath is more practical. pH control should be exercised, nevertheless, since the amount of bleeding of certain dyes is affected by the acidity of the bath.

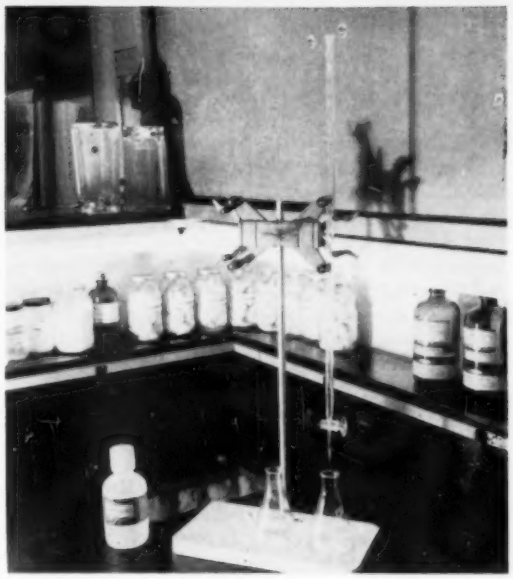
Analysis of the Sealing Bath

The pH of the sealing bath is controlled in the same manner as that outlined for the dye solutions. Best results are obtained with a pH from 5.5 to 6.0. If the pH is too low, some dyes will bleed in the sealing bath. If it is too high, a white deposit which is difficult to remove will form on the work.

The nickel acetate concentration of this bath may be determined by the following procedure:

Reagents required:

Tartaric acid: 25 grams/100 ml water.
Dimethylgloxime: 10 grams dissolved in 1 liter of concentrated ammonia.



Equipment required for analysis of the sulfuric acid anodizing solution.

Procedure:

A 10 ml sample of the sealing bath is diluted to 250 ml and 5 ml of concentrated nitric acid added. This solution is boiled to remove organic matter, allowed to cool and filtered.

Ten ml of the tartaric acid solution is added and the solution neutralized with ammonium hydroxide. The nickel is precipitated by adding 30 ml of the dimethylglyoxime solution. After standing for 30 minutes the precipitate is removed by filtration through a weighed Gooch crucible washed with hot water, and dried for 1½ hours at 125° C. In performing this determination it is best to run three separate samples to eliminate any possible error.

Calculation:

Nickel acetate in grams/liter = grams of precipitate × 61

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NICKEL ELECTROFORMING

by Dodd S. Carr*

ABSTRACT

Nickel electroforming is an *electrochemical process* for the production of new structural forms or the reproduction of existing shapes by the electrodeposition of nickel upon a removable mold or pattern. It differs from ordinary nickel plating in the degree of adhesion required and in the thickness of deposit required. In normal plating the nickel must adhere firmly to the basis metal and it is usually less than several thousandths of an inch thick, whereas in electroforming the nickel must *not* adhere firmly to the surface upon which it is deposited, and its thickness usually exceeds 0.010 inch. The nickel electroforming process consists of three general steps, namely, (1) the design, fabrication, and preparation of a suitable mold for nickel plating; (2) the selection of an appropriate nickel plating solution and "building up" of nickel on the mold; and (3) the final machining and grinding of the electroformed nickel object to the specified dimensions. Advantages of nickel electroforming include the following: production of intricate shapes that are difficult or impossible to machine; maintenance of close dimensional tolerances; production of smooth dense internal surfaces; complete reproduction of fine detail; close control of physical and mechanical properties; high resistance to corrosion and to oxidation at elevated temperatures; strength of one-piece construction; production of thin, uniform wall thicknesses; and assembly of components into an integral shape. The major limitation of the nickel electroforming process is its high cost resulting from high mold costs, high handling costs, relatively high plating and machining reject rates, and small production runs. However, nickel electroforming should definitely be considered for the production of parts requiring close dimensional tolerances and fine surface finishes.

INTRODUCTION

In the spring of 1838 Professor Jacobi reported to the Academy of Sciences in St. Petersburg that he had discovered a process for reproducing objects of metal by galvanoplasty (known today as electroforming). He had made exact molds of artistic objects in wax or plaster, coated every detail with very fine graphite to make them conductive, and then suspended them from the negative pole in a plating bath. In this way he was able to line the molds with a heavy, dense, continuous surface of metal and later separate the metal from the molds. Thus, Jacobi was generally credited with being the father of electroforming, although similar claims were made in England by both F. Spencer and C. J. Jordan in 1839. At that time it was understood how to produce heavy deposits of copper, but nothing was known about electroplating nickel.

A short time later—in 1842—Professor Boettger in Germany pointed out that dense, lustrous deposits of nickel could be obtained from a plating bath containing its double salt, nickel ammonium sulfate. He felt that such deposits should have many applications because of their great hardness, oxidation resistance, and good appearance. However, his work was not widely recognized until many years later when nickel plating was commercially adopted in the United States. Even then, the application of nickel plating to the field of electroforming was not as rapid as with copper or other metals. This was due mainly to the lack of knowledge about nickel plating baths, which at that time were operated at room temperature, relatively high pH, and at very low current densities. Under these conditions only a very thin nickel buildup was possible and the high tensile stresses in the nickel often produced cracking, lifting, and peeling of the nickel from the mold.

Fortunately, great strides have been made in recent years in the knowledge of nickel plating and this information is now readily available.[1] It has made possible the scientific selection of plating baths and operating conditions required to achieve the strength, hardness, ductility, or magnetic properties desired in an electroformed nickel part.

DESCRIPTION OF NICKEL ELECTROFORMING PROCESS

There are three general steps in the process of nickel electroforming, namely, (1) the design, fabrication, and preparation of a suitable mold for nickel plating; (2) the selection of an appropriate nickel plating solution and "building up" of nickel on the mold; and (3) the final machining and grinding of the electroformed nickel object to the specified dimensions. From the above description of the nickel electroforming process, it is possible to define it as an *electrochemical process* for the production of new structural forms or the reproduction of existing shapes by the electrodeposition of nickel upon a removable mold or mandrel.

Nickel electroforming differs from ordinary nickel plating in two major respects: the degree of adhesion required and the thickness of the nickel deposit. In normal nickel plating the deposit must adhere firmly to the basis metal and its thickness seldom exceeds 0.002 inch, whereas in nickel electroforming the deposit must *not* be adherent to the mold surface and its thickness usually exceeds 0.010 inch. Sometimes in the salvaging of mis-machined parts a heavy layer of nickel is deposited on a specific area, but this can not be called electroforming because the nickel

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is firmly bonded to the basis metal. Similarly, wires and other materials may be given a heavy coating of nickel, but in such cases the process should be called simply "building up" and not electroforming. To the metallurgist or engineer the term "cold casting" might be indicative of the electroforming process.

DESIGN, FABRICATION, AND PREPARATION OF A SUITABLE MOLD

To be suitable for electroforming, a mold (also known as a mandrel or matrix) must satisfy the following requirements:

1. It must be *impervious* to cleaning solutions, water, and plating solutions;
2. It must be capable of being made *electrically conductive* if it is non-metallic;
3. It must *meet the surface finish requirements* of the interior of the finished part;
4. It must be within the *dimensional tolerances* of the interior of the finished part;
5. It must be *capable of being separated* from the electroformed part; and
6. It must retain *dimensional stability* in warm plating solutions.

DESIGN OF ELECTROFORMING MOLDS

The design of electroforming molds should be made with close cooperation between the design engineer and a qualified specialist in electroforming before final approval is given to the design. Often it is possible to change the design, in some details immaterial to the finished part, and greatly simplify the electroforming process. For example, if an internal step is required in the part as a bearing surface for another component, the mold can be designed to provide a radius at each end of the step instead of a sharp corner. This will provide the necessary bearing area and also eliminate the problem of plating into a sharp recess when electroforming the part.

Since the shape, surface finish, and dimensional accuracy of the finished part are determined by the mold, the following design factors should be employed:

1. **Avoid sharp recesses** whenever possible. This will result in faster buildup in low current density areas, produce stronger wall sections, eliminate fault-lines or cleavage planes, and reduce the overall electroforming time required to produce a given wall thickness.
2. **Use fillets** in recessed corners if the function of the part permits. In general, the radius of the fillet should equal or exceed the thickness of the nickel required in the corners. The reason for this is that the crystalline growth of nickel deposits is always perpendicular to the surface being plated. Thus, in a 90° corner the crystals will proceed to grow from each wall until they meet along a 45° line. This fault-line or cleavage plane has very little cohesive strength and the nickel may be split along this line with very low applied stress. On the other hand, if a fillet is used the nickel crystal formation resembles a tepee and the adjoining crystals have a cohesive strength equal to the tensile strength of the nickel. As a design rule, it has been reported[2] that if the radius of a fillet in a 90° angle exceeds 0.02 inch per 2 inches of shank length, the thickness of the electroformed metal will be nearly uniform. Thus, to obtain maximum strength in the recessed corners of an electroformed part the above design rule should be followed whenever possible. Of course, even a sharper radius will produce a stronger section than a 90° corner, but the corner will still be proportionately weaker than the optimum design strength given above.
3. **Specify a fine surface finish** on the mold. This will usually be determined by the end use of the electroformed part, such as in electronic applications, but if there is a choice, use as fine a surface finish as possible. The higher the surface finish the easier it is to extract the mold after the part has been electroformed. Obviously, a nick or scratch on the mold will be filled in with nickel and tend to lock the part on the mold. Then, as the mold is removed the interior will be scored deeply by the nickel remaining in the scratch. Accordingly, if a mold is to be used more than once it should be inspected carefully each time and any scratches or other surface defects should be polished out. The above discussion applies mainly to electroformed parts which completely surround the mold.
4. **Have a slight taper** on molds used to electroform parts with a tubular or rectangular structure. This will make it easier to remove the molds after electroforming. A minimum taper of 0.001 inch per foot should be used. However, if it is necessary to electroform a part without a taper, such as a straight section of rectangular wave guide tubing with tolerances of plus or minus 0.001 inch, there are two methods that may be used. One method is to apply a lubricant to the mold, such as wax and graphite, or a low melting metal such as tin or lead. Then, after electroforming, the application of a little heat will allow the nickel part to be slipped from the mold. The second method is to use a mold with a different thermal coefficient of expansion than nickel, such as Invar or Kovar. Upon heating the electroformed nickel it will expand more than the mold and permit separation without marring the interior of the part.
5. **Provide machining fixtures** on molds for parts that require resizing after electroforming. This is especially important where there are close tolerances on wall thicknesses. Naturally, if a mold were off-center in a turning operation, the wall of the part would be thin on one side and thick on the other when the mold was removed. Thus, centers should be provided in such molds to permit easy and accurate machining setups. Also, provision should be made for indicating dimensions on the finished part with respect to the mold. This will require the designation of reference points on the mold from which all other dimensions are to be measured. Finally, pro-

vision should be made for hanging the mold in the nickel bath and for removing the mold with a separating force such as an arbor press or hydraulic ram. If the above design factors are utilized in the preparation of electroforming molds, the job of producing nickel parts with close tolerances, high surface finish, and intricate shapes will be easier and less costly.

FABRICATION OF ELECTROFORMING MOLDS

After the design of an electroforming mold has been approved the next step is to fabricate it. This may be done by machining, casting, or electroforming on a positive mold. The method to be used will be determined to a large extent by the material selected for the mold. Thus, for example, an aluminum mold will be machined, a Cerrobase mold will be cast, and a nickel phonograph stamper will be electroformed on a metal "mother" or duplicate of the original recording. Electroforming molds may be classified into two general groups depending upon whether they are used more than once or are destroyed when being removed from the electroformed part. These groups may be called *permanent molds* and *expendable molds*. A list of materials falling into each classification is given in Tables I and II, respectively, along with the advantages and disadvantages of each type of mold. The final selection of mold material will be governed by the dimensional tolerances and finish requirements of the electroformed part, and by the cost of the mold material.

PREPARATION OF MOLDS FOR BUILDING UP WITH NICKEL

Following the design and fabrication of a suitable mold for electroforming it must be prepared for building up in a nickel plating bath. The method of preparation to be employed will depend upon whether a permanent mold or an expendable mold is used. In general, permanent molds are prepared by thorough cleaning and passivation while expendable molds may require cleaning, sensitizing, and the application of a conductive coating. These two cases will be illustrated using a stainless steel mold as an example of a permanent mold and a polystyrene plastic mold as an example of an expendable mold.

In the case of the permanent stainless steel mold, one is faced with the paradox that the nickel buildup must be both adherent and non-adherent at the same time. That is, the nickel must adhere to the mold just enough to prevent lifting, peeling, cracking, or blistering, and yet be sufficiently non-adherent to permit easy separation of the finished part from the mold. Assuming that a tubular object is to be electroformed on the stainless steel mold, the following procedure is recommended:

1. **Thorough cleaning** of the mold until it is free of water breaks. This may be accomplished by anodic electrocleaning in a properly compounded solution at 180° F (80° C) for 1 minute at 75 amp/sq ft or by mechanical scrubbing with a tampico brush and pumice. Many proprietary electrocleaners are available and they are normally operated at a concentration of about 8 oz/gal. Soak-type cleaners may be used in conjunction with pumice scrubbing and they too are operated at 8 oz/gal and 180° F (80° C). It is of the utmost importance that this step be followed until the surface is free of water breaks on rinsing. Otherwise, the nickel buildup may not be continuous, may blister, or may even lift from the mold prematurely.

TABLE I
PERMANENT TYPE ELECTROFORMING MOLDS*

Material	Advantages	Disadvantages
Aluminum	Easily machined and polished to a high finish. Close tolerances are obtainable. Molds are light and easily handled.	Molds are easily scratched, susceptible to corrosion by plating solutions, and are costly.
Invar, Kovar	Low thermal coefficient of expansion makes mold removal easy by heating the nickel.	Difficult machining and high cost of molds.
Stainless Steel	Passive surface prevents sticking of part to mold. Surface is scratch resistant, but may be repolished. Inert to most nickel baths.	Molds costly, difficult to machine and hard to repair.
Brass, Bronze (Plus Cu, Ni, Cr)	Low in cost, easily machined and easily separated from nickel electroform.	Repairs costly. Overplating and machining for each layer required for new mold.
Glass	Can be highly polished. Close dimensional tolerances obtainable.	Must be sensitized and silvered. Mold is breakable and costly to prepare.
Nickel	May be electroformed from original article. Example, record mother. Accurate reproduction obtainable.	Difficult to obtain thick, flat deposits because of residual stress in the nickel.

* Used many times. They may consist of one or more parts. For example, two-piece permanent molds are bolted together to electroform venturi nozzles and then one-half is removed from each end of the finished part.

TABLE II
EXPENDABLE TYPE ELECTROFORMING MOLDS*

Material	Advantages	Disadvantages
Low-Melting Alloys (Ex.: Cerrobase, m.p. 255° F)	Metal can be cast at low cost and used many times by re-casting. It is easily removed by dipping in hot oil.	Alloys containing tin may be difficult to remove. Tolerances are not as accurate.
Plastics (Ex.: Polystyrene)	Molds are relatively cheap and may be machined to fairly close tolerances. They are easily removed by heat or solvents.	Surface must be made conductive. Molds are not suitable for hot baths but may be used in warm solutions.
Soluble Metals (Ex.: Aluminum)	Close tolerances are obtainable with good machinability. High finishes are also obtainable. Mold is easily removed by dissolving in hot sodium hydroxide.	Soft surface may be scratched. Zincate treatment is required. Molds are costly.

* Used when the part is unusually complicated, has re-entrant angles, and has liberal dimensional tolerances.

2. **Acid dipping** in dilute sulfuric acid (10 per cent or 9.0° Baume) or dilute hydrochloric acid (10 per cent or 6.6° Baume) at room temperature. This neutralizes any residual cleaning solution on the mold and produces a surface that is uniformly active. A thorough rinsing and flushing of the mold is required after the dip in order to remove any excess acid from the mold.
3. **Passivating** in a dilute potassium dichromate solution (1–4 g/l or 0.13–0.53 oz/gal) to permit easy removal of the mold after electroforming. This solution should be checked regularly for concentration and should be kept free of oil, grease, or other dirt that might soil the mold surface. After dipping in the potassium dichromate, the mold is thoroughly rinsed and transferred to the nickel plating tank for building up.

If auxiliary parts are to be attached to the mold, they should be thoroughly cleaned, prepared for nickel plating, and assembled on the mold just after the passivating step. Such auxiliary parts might be metal inserts of nickel or some other metal which are to become an integral part of the completed nickel electroform. Other auxiliary electroforming equipment such as conforming anodes, current thieves, bipolar electrodes, or insulating shields should also be assembled on the mold after the passivating step and before the mold is transferred to the nickel plating tank.

In the case of the polystyrene plastic mold the surface is cleaned, sensitized, silvered and copper flashed in preparation for building up with nickel. The copper flash is later stripped from the electroformed nickel part with a chromic acid-sulfuric acid solution. Detailed descriptions of the sensitizing and silvering procedures are available.[3, 4] After silvering, the mold s given a copper flash in an acid copper bath, rinsed, and transferred to the nickel buildup tank.

Other methods of preparing molds for electroforming include the application of films of silver sulfide, silver iodide, or fusible metal such as lead, tin, or cadmium. In the case of expendable aluminum molds a zincate film is applied to improve adhesion of the nickel buildup and later the aluminum is dissolved out of the nickel electroform in a hot caustic solution.

SELECTION OF APPROPRIATE NICKEL PLATING SOLUTION

Perhaps one of the greatest advantages of nickel electroforming is the wide range of physical and mechanical properties that may be obtained in the finished part merely by selecting the proper plating solution and operating conditions. Thus, it is possible to obtain soft, ductile, low-strength, and low-stressed nickel deposits by using a nickel sulfamate bath operated without addition agents at 130° F (55° C) and at pH 2.0. However, the same bath operated with an addition agent such as 1,3,6 Naphthalene trisulfonic acid, sodium salt[5] at 120° F (49° C) and at pH 4.0 will produce hard, semi-ductile, high-strength, and compressively-stressed nickel deposits. Other combinations of hardness, ductility, strength, and residual internal stress may be obtained by selecting a plating bath and operating conditions from the work reported in the AES Research Report, Serial No. 20.[1] To indicate the range of these properties, a brief summary is given in Table III. The final selection of plating solution and operating conditions should be based on the requirements of the finished part.

For example, if a hard, low-stressed, nickel were required for molding plastic buttons, the latter sulfamate bath described above might be used. However, if the mold had to withstand temperatures above 500° F (260° C) it would be unsatisfactory because the nickel would soften and tend to crumble under stress because of sulfur embrittlement. On the other hand, if the electroformed part had to have high strength, moderate hardness, and moderate ductility, it would be advisable to use the all-chloride bath. But, this type of nickel has the disadvantage of being highly stressed and precautions must be taken so that it will not split away from the mold during the build up. Notwithstanding this drawback, the all-chloride nickel has excellent machining properties and does not tend to "tree" when heavy deposits are built up. Finally, if a soft, ductile nickel is required, so that the electroformed part may be spun or cold drawn, a Watts nickel might be used. This type of deposit has about one-half the residual stress of the all-chloride bath and is, therefore, easier to build up. However, it does tend to "tree" badly on edges and corners

TABLE III

COMPARISON OF SELECTED PROPERTIES OF NICKEL ELECTRODEPOSITED AT 130° F (54° C)

Type of Bath Selected	Ref.	pH	Current Density	Residual Stress	Vickers Hardness	Tensile Strength	Per cent Elongation (in 2″)
All-Chloride	(1)	3.0	50 asf	42,000 psi	244	102,000 psi	14
Sulfate-Chloride	(1)	3.0	50	31,000	212	74,000	20
Watts	(1)	3.0	50	17,000	150	56,000	28
All-Sulfate	(1)	3.0	50	17,000	202	66,000	20
Fluoborate	(16)	2.6	50	15,000	128	55,500	32
Sulfamate, Plain	†	2.0	50	8,000	150	55,000	30
Sulfamate, with Stress Reducer*	(5)	4.0	50	—5,000**	500	——	—
Watts, with Additive***	†	4.6	50	—5,000	591–613	——	—

† Unpublished results.
* Measurements were made at 120° F (49° C) using 7.5 g/l of 1,3,6 Naphthalene Trisulfonic Acid, Sodium Salt.
** The normal residual stresses in nickel deposits are contractile (tensile) and are designated as positive stresses. Negative stresses are expansive (compressive).
*** Proprietary Addition Agent, patent pending.

and is more difficult to machine than all-chloride nickel deposits. From the above discussion it can be seen that a compromise must be made between the ideal electroforming conditions and the type of solution which is required to give the desired properties in the electroformed nickel object.

BUILDING UP OF NICKEL ON THE MOLD

Once the proper type of plating solution has been selected, the problems associated with the building up of nickel on the mold will have to be solved. In general, the problems associated with normal nickel plating are greatly magnified in electroforming because of the longer plating times involved. A few of these problems and recommended solutions are given below.

1. **Non-Uniform Nickel Thickness** results from uneven current distribution on the mold. Some of the techniques used to overcome this problem are: the use of *conforming anodes* to assure uniform anode to cathode spacing; the use of *bipolar electrodes* for plating into recessed areas; the use of *current insulating shields* on edges and corners to shift the current distribution into recessed areas; and the use of *current "thieves" or "robbers"* positioned close to high current density areas to steal the excess current. The last method is not recommended since it wastes nickel, can be used only a few times and decreases in usefulness because it over-protects as it builds up.
2. **High Residual Internal Stresses** in the nickel buildup: tend to cause premature splitting of the part on the mold; often distort critical dimensions, especially diameters; sometimes cause shrinkage on the mold and prevent removal of the part; and always tend to cause lifting and curling at the corners of flat sheets. These high stresses may be caused by metallic contamination, organic contamination, or by improper operating conditions. It is possible to determine the residual stress in a nickel deposit from a given bath with a spiral contractometer[6] before a mold is put in for nickel buildup. If the stress is higher than normal the bath should be checked for one of the above sources of high stresses. Metallic contamination, such as iron and copper, may be removed by a high pH treatment followed by low current density electrolysis at low pH (2–5 asf at pH 2.0). Organic contamination, such as decomposed wetting agent, grease, oil, anode bag sizing, or uncured rubber, may be removed from the nickel bath with an activated carbon treatment. Improper operating conditions, such as too high a pH, too low a temperature, or too high a current density, should be corrected. After the nickel bath has been corrected, the stress should be measured again before molds are put in for buildup.
3. **Poor Throwing Power** may result from improper solution compositions, or from organic contamination. The solution should be analyzed for nickel content, boric acid, and other constituents and brought into proper balance. Then the pH, temperature, current density, and agitation should be adjusted to proper levels. Finally, the bath should be checked in the laboratory for the effect of carbon treatment to remove organic impurities.
4. **Pitting** results when bubbles of hydrogen gas that form on the nickel surface are not released. Excessive iron contamination and organic contamination will usually result in pitted nickel deposits. A high pH treatment and activated carbon treatment will usually reduce pitting. The use of hydrogen peroxide (0.5 ml 30 per cent H_2O_2 per liter of solution) or the use of a wetting agent (0.10 g/l) will normally eliminate pitting entirely. These two antipitting agents should not be used together since the peroxide will tend to decompose the wetting agent and cause further pitting and high stresses.
5. **Nuggets** tend to form on the surfaces of electroformed parts when solid particles become attached. The particles may come through a torn anode bag, may drop from overhead equipment, or may be carbon that leaked through the filter. In any case, the nugget will usually cause rejection of the part. It usually becomes greatly enlarged because it acts like a corner and draws excess current. And, the faster it grows the more current it draws. Thus, it is clear that electroforming baths should be filtered carefully and kept free of solid particles to prevent the formation of nuggets.
6. **Treeing** is a finger-like growth of nickel crystals on

exposed corners of electroformed parts. It may be reduced by using shields to protect exposed corners or it may be reduced by increasing the nickel chloride concentration of the plating bath. An all-chloride bath produces small smooth, round nodules instead of trees, but the high residual stress in such deposits usually prevents its use for electroforming flat objects.

7. **Splitting** of the nickel on the mold is a result of stress-relieving. If a highly-stressed deposit is produced on a non-adherent surface, such as an electroforming mold, it will usually split longitudinally. The plating bath should be treated to reduce the highly stressed conditions in the nickel part before further work is put into the tank. Excessive potassium dichromate on the mold may also prevent sufficient adhesion of the nickel to the mold and thus produce splitting. The molds should be thoroughly rinsed after the passivating treatment in order to prevent splitting.
8. **Wrinkling** of the deposit on the electroforming mold may be caused by insufficient cleaning or by excess potassium dichromate on the surface. In either case, the mold should be cleaned thoroughly and dipped again in the dichromate separator. The wrinkling is usually evident after the first few minutes of nickel plating and a short interruption of the plating cycle to inspect the mold at that time may save hours of electroforming time if the nickel buildup is defective. If it is acceptable, the part may then be rinsed, given an acid copper flash, and put back in the nickel tank for further buildup.
9. **Burning** is caused by excessive current density on local areas, usually edges and corners of molds. It may be reduced by increasing the nickel and boric acid concentration of the bath, by increasing the amount of agitation, or by plating at a slower rate.
10. **Unplated areas** result when an oil or grease film gets onto the surface of the mold. Fingerprints will produce the same effect. Decomposed wetting agent or emulsified oils on the surface of the nickel plating bath may sometimes become attached to the mold as it is lowered into the solution. Such films may be skimmed off or blotted with layers of tissue paper, but usually the solution will require an activated carbon treatment and filtration to restore it to successful use for electroforming.

IMPROVEMENTS IN PLATING BATHS USED FOR NICKEL ELECTROFORMING

Before proceeding to the methods used for machining and grinding nickel electroforms, a review of some of the developments in nickel plating baths and their operation will be given. Over the years these improvements have widened the scope and knowledge of nickel electroforming and one of the developments, the use of leveling agents, may still be too recent to have been applied to electroforming. The following twelve examples illustrate improvements in both the bath chemistry and the operating conditions of the bath:

1. The use of *buffers* (such as boric acid) for maintaining a relatively uniform pH, producing smoother nickel deposits, and permitting faster plating rates without burning the deposit;
2. The use of *highly soluble nickel salts* (such as nickel sulfate, nickel chloride, nickel sulfamate, and nickel fluoborate) for maintaining a higher metal content in the bath, improving the solution conductivity, increasing the cathode efficiency, improving the throwing power in recesses, and permitting faster plating rates;
3. The use of *chlorides* (such as nickel chloride, ammonium chloride, or sodium chloride) to improve anode corrosion, obtain harder deposits, reduce treeing, increase cathode efficiency, improve throwing power, and increase solution conductivity;
4. The use of *wetting agents* (such as sodium lauryl sulfate[7]), instead of hydrogen peroxide, to prevent pitting and permit the use of organic addition agents in nickel plating baths;
5. The use of *stress reducers* (such as naphthalene trisulfonic acids[8] and saccharin[9]) to reduce residual contractile (tensile) stresses, to increase hardness and strength, to prevent cracking and peeling, and to permit faster plating rates;
6. The use of *leveling agents* (such as coumarin compounds[10] and acetylenic compounds[11]) to reduce the plating time required to fill in recessed areas and conserve nickel by producing a more uniform wall thickness with less metal;
7. The use of *higher temperatures* (in the range of 130° F (55° C), and above) to reduce burning at high current densities, increase solution conductivity, permit higher metal concentrations in solution, lower the residual tensile stresses in the nickel, increase the cathode efficiency, and permit faster plating rates than in room temperature baths;
8. The use of *lower solution* p*H* (between 2.0 and 5.0 instead of over 5.5) to improve anode corrosion, increase solution conductivity, reduce burning at high current densities, and permit faster plating rates;
9. The use of *increased agitation* (relative motion of the solution and the electroforming mold) by means of cathode motions or solution jets to permit faster plating rates, improve throwing power in recessed areas and reduce surface roughness;
10. The use of *filtration* (either continuous or intermittent) to reduce surface roughness on electroformed parts, improve the agitation in the bath, and remove organic contaminants with a layer of activated carbon on the filter cake;
11. The use of *periodic current reversal* (PR nickel plating[12]) to prevent excessive buildup on corners, edges, and other prominences, increase the nickel thickness in recessed areas, and conserve nickel by producing a more uniform coating with less metal; and
12. The use of *superimposed alternating current*[13] to reduce the residual contractile (tensile) stresses in nickel deposits, prevent cracking and peeling, and permit faster plating rates.

It should be pointed out here that several of the above

improvements are covered by unexpired patents and that suitable licensing arrangements should be made with the licensor before they are used by others.

REMOVAL OF MOLDS FROM ELECTROFORMED NICKEL PARTS

If the nickel electroform does not require final machining, the mold is usually extracted at this point. Also, the mold is removed before machining if it is necessary or desirable to machine the nickel on an arbor, so that the mold can be building up with nickel again in the meantime. Otherwise, the part is left on the mold until after machining and then it is removed. The method of removal will depend upon whether the mold is of the permanent type or of the expendable type.

REMOVAL OF PERMANENT TYPE MOLDS

Permanent molds may be removed from nickel electroforms by one of the following methods or by a combination of them:

1. **Impact,** applied suddenly with a hammer or gradually with a hydraulic ram, may be used to disgorge or press molds from electroforms having a cylindrical, rectangular, or tapered shape.
2. **Tension** applied by devices such as wheel pullers may be used to pull nickel electroforms off permanent molds. Of course, this method may be used only on parts which can be grasped by a wheel puller.
3. **Prying** with a sharp knife or chisel may be used to remove flat or slightly curved molds, such as phonograph stampers or engraving plates.
4. **Heating** with a torch or dipping in hot oil may be used to remove molds from nickel electroforms. In the first case, the nickel will expand faster than the mold inside and permit easy removal by pulling. In the second case, a mold lubricant—such as wax and graphite—will soften and allow the electroformed nickel to be drawn from the mold.
5. **Cooling** in a mixture of dry ice and organic solvent (such as acetone) may be used. When the part is lifted from the cold bath the nickel tends to expand faster than the mold and permit easy removal. Naturally, the mold must have a much lower thermal coefficient of expansion if this method is to be effective.

REMOVAL OF EXPENDABLE TYPE MOLDS

Expendable type molds, by their very nature, are destroyed in the process of removing them from nickel electroforms. In some cases, such as low melting temperature alloy molds, the material may be used over and over while in other cases, the mold is dissolved and the material may not be salvaged. Several of the methods for removing expendable molds are the following:

1. **Melting** may be used to remove molds cast from low-melting alloys of the lead-bismuth type. Hot oil will melt such alloys at about 256° F (124° C) and allow them to be shaken from the nickel electroform.
2. **Dissolution** in organic solvents such as chloroform may be used to remove soluble plastic molds, like polystyrene. Although this method is effective, it is both hazardous and expensive. Hanging the parts in a vapor degreaser containing perchlorethylene is more practical if the plastic is soluble.
3. **Heating** the nickel electroform with a torch is an effective method of softening thermoplastic molds so that they may be pulled out. The residue in corners and recesses is removed by dissolution in suitable solvents.
4. **Stripping** the mold from the nickel electroform is possible in the case of expendable aluminum molds. They are readily stripped from the nickel in a hot sodium hydroxide solution without affecting the nickel.

FINAL MACHINING AND GRINDING OF NICKEL ELECTROFORMS

Where close tolerances on the outer nickel surfaces are not required, the electroformed part may be finished by machining. But when accuracy is required, and when it is feasible to do so, grinding should be used for all finish operations. These two operations, machining and grinding of nickel electroforms—are described below.

MACHINING NICKEL ELECTROFORMS

In general, nickel electroforms may be machined on conventional equipment, using standard cutting tools. But with some types of electrolytic nickel, such as the harder all-chloride type, conventional tools do not give good tool life or performance. Surprisingly, even tungsten carbide tools do not last as long or perform as well on harder nickel electroforms as do some of the special alloy tools. For example, Tantung G tools have performed well on nickel machining operations where high speed tools and carbide tools were not satisfactory.

As a rule, all cutting tools should be given as liberal a nose radius as possible for turning operations. Also, all sharp edges on other tools—such as shaper tools, milling cutters, and form tools—should be rounded where possible in order to prevent chipping and crazing. Regarding rake and clearance angles, the tools should be given sufficient front and side clearance to prevent rubbing and yet not weaken the tool. Depending upon the type of nickel and type of machine, the rake angles should be between 3° and 7°. The use of chip breakers—either mechanical or non-mechanical—is highly recommended in order to prevent the accumulation of long, stringy chips which are difficult to remove from the tools. The use of soluble oils is recommended for dissipating heat and increasing tool life. Since considerable quantities of heat are generated in machining nickel electroforms, mist-type cooling is suggested because it is less messy and provides better cooling.

Softer nickels, such as the all-sulfate type with a Vickers Hardness Number of about 180, are difficult to machine because they have a spongy texture and tend to weld to the tool edge. This will sometimes rip nickel from the electroformed part being machined. Harder nickels, such as the all-chloride type with a hardness of 250 VHN, machine much more readily. Long, hard chips are produced which are easily broken by chip breakers. Machining speeds and feeds will vary with the type of equipment

and the depth of the cut. In general, they will approximate those for stainless steels and nickel alloys such as Monel and Inconel. Thus, for example, the machining speed may be between 150 and 300 feet per minute and the feed per revolution between 0.004 and 0.040 inch, depending upon the type of tool.

GRINDING NICKEL ELECTROFORMS

Because of the relative ease with which nickel electroforms may be finished by grinding as compared with machining, it is recommended that this method be used whenever possible. Greater accuracy and smoother surfaces are also obtainable by grinding. For example, as-ground finishes will approach 16 RMS or better, depending upon the type of wheel used. In rough grinding the wheels should have an Alundum abrasive with a grain size between 36 and 80, and for finish work the grain size should be between 80 and 150. Grinding wheels with a medium hardness, medium to open structure, and a vitrified bond produce the best results. Thus, wheels of the type DA-60-J6-V 11, should be used for rough grinding and type 97A-150-J5-V 35 for finish grinding. Since the softer types of nickel electroforms (including the sulfamate type without stress reducers, the all-sulfate type, and the low-chloride type of Watts nickel) tend to load up the grinding wheels faster than the harder nickels, it is necessary to dress off the grinding wheels more often with a diamond tool when grinding the softer nickels. Just as in the case of machining nickel, the generation of heat is a problem with grinding, and cooling is required, usually by a stream of soluble oil.

APPLICATIONS OF NICKEL ELECTROFORMING

Nickel electroforming has found many applications where the combination of intricate shape, high surface finish, close dimensional tolerance, and high strength is required. Electroformed nickel parts may vary in size from fine tubing electroformed on silvered glass filaments up to huge molds for plastic bubbles on aircraft. The use of nickel electroforming to produce fountain pen caps, record stampers, reflector lens molds, electronic parts, and metal screening has been reported.[14] An excellent review of the technical literature and patent literature on electroforming was reported by Safranek, et. al.,[15] as well as a detailed description of the electroforming of fountain pen caps. In general, economic considerations often are responsible for the bypassing of nickel electroforming in favor of some other form of production. The relatively high cost of electroformed parts is due to the fact that they are seldom mass produced, the molds are expensive, the reject rates are often high, and the designs are frequently changed. In spite of this, nickel electroforming does have a definite—though limited—place in industry.

ACKNOWLEDGMENT

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He began his professional career in 1949 as a research chemist at the International Nickel Company Research Laboratory in Bayonne, N. J. where he was engaged in electroplating research. In 1952 he became assistant director of electrochemical research for the Laboratories Division of Bart Manufacturing Corporation. Since October 1956 he has been director of research for Bart.

Dr. Carr is an active member of the AES, Electrochem. Soc., ASTM, Committee B-8, ACS, Society of the Sigma Xi, and is listed in "American Men of Science" and "Chemical Who's Who." He holds electroplating patents and was co-author of the paper "Nickel Plating With Insoluble Anodes" which won the Silver Medal at the 1952 AES Convention. He was recipient of the International Nickel Company Research Fellowship at Johns Hopkins University in 1948 and 1949.

EPOXY RESINS

by A. F. Rylander*

THE EPOXY RESINS PRODUCE COATINGS which have distinct and unique properties over many commonly available. The epoxy resins are capable of wide modifications, and this property can be utilized to obtain many desirable features. The epoxy resin coatings are becoming increasingly more important in the coatings field, and it is the purpose of this discussion to compare the various types of modifications of the epoxy resins, their uses, and in what way they possess good properties and what their deficiencies may be.

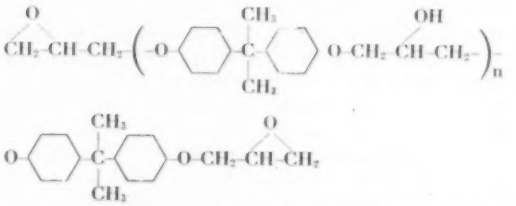
CHEMISTRY

There are references in the German chemical literature as far back as 1896 on the mechanism for preparing the epoxy resins. However, like so many reactions, they remained a laboratory curiosity with few references being found in literature of various countries down through the years. Research on the epoxy resins accelerated in the 1930's with the result that soon after the end of this decade, patents were obtained by firms both in the United States and Europe covering this type of composition. The commercial development of any type of composition is dependent of course upon the availability of raw materials. It was not until the latter part of the 1940's with the start of commercial production of epichlorohydrin, a basic raw material in the manufacture of the epoxy resins, that commercial quantities of the resins were available.†

The bulk of the epoxy resins to this date have been used in paints and enamels. However, the so-called structural uses which include adhesives, potting and casting compounds, laminating resins and tool and die manufacturing, have continued to show giant strides. It is the consensus of opinion that in following years, structural applications for the epoxy resins will equal or surpass those going into surface coatings.

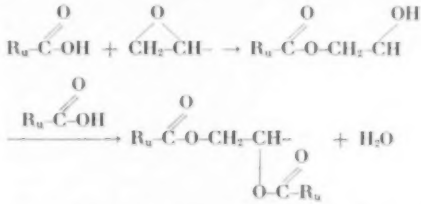
Basically, the epoxy resins are formed by reacting given amounts of epichlorohydrin and bi-phenols, such as Bis Phenol-A.†† This reaction produces a linear polymer which could be called a "phenolic" but has properties which this well-known class of materials do not possess. The polymer is built up with ether linkages which are very resistant to breakdown, and they thus present very good chemical resistance. The widely used alkyds are, for instance, nearly always built up through esterification and the esters are not nearly as chemical resistant.

A representative epoxy structure may be illustrated as follows:



In the foregoing structure, "n" is a number of magnitude dependent upon the degree to which the etherification is carried. It may vary from 2 to 15 or 20 with resulting molecular weights of approximately 900 to 3750.

The presence of the epoxide groups and hydroxyl groups makes this structure capable of wide chemical modification. It is this property that so greatly increases their usefulness in many directions. They, for instance, may be reacted with various acids to form esters or may be caused to cross link by the use of various polyamines. A typical reaction of the epoxide group with an acid, such as an oil acid, may be illustrated as follows where R_u represents an unsaturated radical in a vegetable oil acid.



The hydroxyl group within the "n" bracket of the original epoxy structure may also esterify so that in a case where "n" represents 5 or 6 groups, it can be seen that a total of 9 to 10 points are available for esterification.

TYPES AND PROPERTIES OF EPOXY RESINS

The epoxy resins are produced in various molecular weights and range from liquids through brittle solids to very tough resinous materials. Of those produced by various manufacturers, the following Epon resins† are representative of those used in the coatings field.

Epon 1001	MW approximately 900	MP— 64– 76° C
Epon 1004	MW approximately 1400	MP— 95–105° C
Epon 1007	MW approximately 2900	MP—127–133° C
Epon 1009	MW approximately 3750	MP—145–155° C

The lower molecular materials are quite soluble in com-

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† Commercially produced by Shell Chemical Corporation.

†† Manufactured by Dow Chemical Company.

mon solvents such as the aromatic hydrocarbons with small amounts of ketones or ether alcohols, but as the molecular weight increases solubility decreases and in the higher molecular materials solvents such as ketones and alcohols must predominate to obtain solution. The lower molecular weight resins have more functional groups which can react with various acids or cross linking agents and therefore are widely used for this purpose. In selected cases, such as in certain phenolic modifications, chemical resistance is better with the lower molecular weight resins if they can be baked sufficiently to obtain complete cure.

EPOXY MODIFICATIONS

The epoxy resins are rarely used without further modification in protective coatings. The four modifications generally used are:

1. Modification of epoxy resins with urea or melamine-formaldehyde resins.
2. Modification of the epoxy resins with phenol-formaldehyde resins.
3. Esterification of the epoxy resin with various oil acids to form esters.
4. Modification of the epoxy resin with various cross linking agents, such as the polyamines or polyamides.

A. Urea or Melamine Modifications

The epoxy resins in suitable solvents can be modified by various urea or melamine resins. These modifications are baking types and require temperatures ranging from 200 to 400° F for cure. After cure, they will have good solvent resistance, excellent alkali resistance and will have good resistance to acids, detergents, many chemicals and water. In this respect, they are only slightly inferior to the phenolic resin modifications. They retain good color upon baking and do not show excessive discoloration upon overbakes.

B. Phenolic Resin Modifications

Highly resistant finishes can be obtained by modification with the heat reactive phenolic resins. These require baking at temperatures of 300 to 450° F for full cure. Their color is deeper than that of the melamine or urea types, and is such that light colored enamels cannot be prepared. In order to hasten cure of this type acid, catalysts are frequently used, the most common being phosphoric acid. When properly cured, these types are resistant to practically all solvents and are extremely resistant to strong acids, such as glacial acetic acid. They are also highly resistant to caustics and detergents. Of course, the above resistance properties are dependent upon the type of phenolic resin used as the modifier, the extent of the modification and the type of epoxy resin used.

C. Epoxy Esters

Perhaps the greatest variety of epoxy resin modification can be found in this class. The epoxy resins can be reacted with almost any acid ranging from acetic to the high molecular weight oil acids. The oil acids used may be those derived from the relatively saturated types such as coconut and cottonseed to the more unsaturated types such as soya and linseed. The former are suitable for baking types modified with other thermosetting resins, while the latter are commonly used for air drying types. The epoxy esters combine the chemical resistance of the resins itself with the drying features of the oil acid used. The epoxy esters are the most economical way of modifying the epoxy resins since they eliminate the necessity of using more costly solvents and the oil acids are lower in cost. The epoxy esters are compatible with a great variety of other film formers, and may, for example, be combined with the melamine or urea-formaldehyde resins to produce baking finishes. However, the greatest use of the epoxy esters are found in air drying finishes.

D. Catalyzed Epoxy Resins

The epoxy resins dissolved in suitable solvents may be cold cured at room temperature or slightly elevated temperatures by the use of polyamines such as ethylenediamine or diethylene triamine which cross link with the reactive groups of the epoxy resins to effect cure. These catalyzed epoxy resins have limited pot life and require application within a few hours after mixing. In many cases a digestion period is necessary to avoid blooming and early sensitivity to moisture and humidity.

The catalyzed epoxy resins after proper curing periods have excellent chemical resistance. They have good resistance to alkalies, mild acids, and most solvents. Optimum resistance is possible after 48 to 72 hours air drying, and this time can be greatly decreased at moderate baking temperatures.

The polyamides may also be used as curing agents for the epoxy resins. In this case the pot life of the mixes are considerably greater than that of the polyamines and application properties are better. The latter types, however, do not develop as good solvent resistance as the former. With proper regard for release of solvents, the catalyzed epoxy types can be applied in extremely heavy films, and the film will cure thoroughly without defects such as wrinkling or softness of the underfilm.

APPLICATION AND USES FOR EPOXY FINISHES

The epoxy resin modifications may be used either as clears or in pigmented finishes. Pigmentation is made in the normal manner and generally the modifications have good application properties. They may be sprayed, brushed or dipped depending upon the modification used. Some fields in which the epoxy resin compositions have found wide use are the following:

A. Maintenance

The epoxy resin types have satisfied a great need in this field. Because of their outstanding acid and alkali resistance, they are widely used where corrosive conditions exist, such as in the oil fields and in chemical plants. In general, these applications are for air drying finishes and the epoxy esters are commonly used. They are suitable for both interior and exterior work. Compared to the alkyd resin type they have, of course, much better chemical resistance, but they do not have the resistance to chalking

(Continued on page 1434)

History of ASTM Committee B-8

by William Blum*

EARLY BACKGROUND

IT WAS NATURAL that among the early activities of ASTM Committee A-5 on Corrosion of Iron and Steel and Committee B-3 on Corrosion of Non-ferrous Metals and Alloys, consideration should be given to the use of protective metallic coatings. When Committee A-5 was organized in 1907, the principal metallic coating used on steel was zinc, then generally applied by hot-dipping. In 1922, when Committee B-3 was organized, the metallic coatings on non-ferrous metals were usually applied by electroplating, but for appearance rather than for protection.

The first recorded specific studies by ASTM on electroplated coatings were started about 1927 by A-5 Subcommittee on Hardware Specifications (now Subcommittee XIII). In this investigation, steel articles of many shapes, including those used in pole-line hardware (plates, angles, washers, bolts, and nuts) were coated by various methods, including hot-dipped, sherardized and electroplated zinc; electroplated cadmium; hot-dipped lead; and hot-dipped aluminum. Specimens of each kind were exposed in several locations, including New York, N. Y., Sandy Hook, N. Y., Pittsburgh, Pa., State College, Pa., and Key West, Fla.; and were inspected at intervals by interested members of the subcommittee.

The results that were reported within a few years were unfavorable to the electroplated zinc and cadmium coatings. In the light of present knowledge, this observed inferiority of electroplated coatings was at least partly caused by the following:

1. The specimens were all prepared under commercial conditions, with no special efforts to produce uniform coatings. In other words, they were typical of what was then being done, rather than of what might be done.
2. By the methods then used commercially, the electroplated coatings were much thinner than the hot-dipped coatings. (This is a valid argument for the use of electroplating when only thin coatings are required.)
3. Many of the shapes, especially the angle irons, were such that electroplating did not furnish as nearly uniform coatings as were normally produced by hot-dipping. Hence the plated coatings usually failed at those points where the coatings were abnormally thin.
4. No systematic effort was then made to measure the average or minimum thickness of the coatings produced by the various methods. This apparent oversight was caused in part by the lack, at that time, of convenient reliable methods for measuring the minimum thickness of coatings.

This disparagement of electroplated coatings immediately aroused criticism from members of the American Electroplaters' Society and others associated with plating. They felt, with some justification, that insufficient information and cooperation had been received from the electroplating industry to adequately represent the possibilities of electroplating procedures. Numerous discussions took place, for example, at annual and branch meetings of the AES. It was then informally decided to try to get more persons connected with electroplating to join the ASTM, and thus to stimulate ASTM interest in studies on, and specifications for, plated products. I joined the ASTM in 1929 deliberately for this purpose.

THE JOINT ASTM-AES COMMITTEE

It took about two years to persuade the officials of Committees A-5 and B-3 that a special study of electroplated coatings was warranted. Finally, in 1931, it was decided to conduct exposure tests of electroplated coatings on steel and non-ferrous metals, under the direction of a joint committee consisting of representatives of ASTM Committees A-5, B-3, and B-6, and the Research Committee of the AES. A research associate, Paul W. Strausser, was appointed to prepare the specimens at the National Bureau of Standards. His salary and traveling expenses were paid by the AES; the NBS furnished space, facilities, and supervision; manufacturers donated the steel, anodes, and plating chemicals; and the ASTM supplied the exposure sites and paid for the construction and installation of the exposure racks. It was truly a cooperative enterprise.

The first specimens consisted of flat 4 by 6-in plates of low-carbon steel plated with nickel or copper-nickel of known thickness, plus chromium. A total of 70 sets, each consisting of about 50 specimens, were plated under conditions that fostered uniform thickness on each specimen and among companion specimens. They were exposed in 1932 in sets of five in six locations, namely, New York, Sandy Hook, Pittsburgh, State College, Washington, D. C., and Key West. They were inspected by an average of about five persons, at six or more intervals during the next two years, resulting in over 60,000 individual specimen ratings, all of which were used in compiling results and reaching conclusions.

A simple system of rating on a logarithmic scale of 0 to 5 was employed, with special reference to the appearance and extent of rust. In subsequent series, in which plated coatings on copper, brass, and zinc were exposed, the ratings were based on all defects. This simple system made it possible to draw objective conclusions, based on arithmetical averages of the successive ratings. During the subsequent related projects of Committee B-8, this system was modified to a scale of 10 and refined, while still retain-

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ing the basic principles of the original procedure. The more recent inspections have been facilitated by the use of "standard" photographs to represent different ratings for typical specimens. Colored photographs have been helpful, within the limitations caused by difficulty in getting uniform illumination, especially of bright reflecting surfaces. The inspection problem resolves itself into the designation of quality and performance by means of numbers that can be reliably assigned by individual inspectors without consuming too much time. A compromise between a "perfect" evaluation and practicality may be necessary.

The results of these and subsequent exposure tests were published by the National Bureau of Standards.[1, 2, 3] In each of these papers, the details of the preparation and plating are fully described. These studies showed that the major factor in the protective value of plated coatings is their minimum thickness and that other factors usually have minor, though significant, effects.

These results and knowledge gained by industry served as the basis for specifications for electroplated coatings that were first prepared by the joint committee in 1935 and have since been frequently revised and extended.

B-8 COMMITTEE

While the organization and activities of the joint committee made the above studies possible and effective, the official actions were sometimes cumbersome. Technically, it was necessary to have each publication and specification approved by ASTM Committees A-5, B-3, and B-6, and by the research committee and executive committee of the AES. Practically, such actions were perfunctory, because most of the persons involved were members of both the ASTM and AES

This dilemma was solved in 1941 by the formation of ASTM Committee B-8 on Electrodeposited Metallic Coatings. The present functions of this committee are defined as follows:

"To prepare specifications for electrodeposited and chemically reduced metallic coatings of all kinds on all types of basis materials, subsequent treatments of such coatings, methods of testing these coatings and materials required for their production; including all pertinent investigations of the substrates, methods of production, the properties of these deposits and their performance under conditions of use and test; excluding only specifications for metal products to which such coatings are applied."

This scope is sufficiently broad to cover all studies that may be involved in the ultimate preparation of adequate specifications for plated and related metallic coatings.

Since 1941, Committee B-8 has functioned successfully and effectively and has mantained cordial cooperation with Committees A-5, B-3, and B-6, and with the AES. The latter organization, through its research committee, is conducting extensive studies, many of which will yield results that can be directly applied by Committee B-8. Most of these specifications were prepared jointly by the American Electroplaters' Society, the National Bureau of Standards, and the American Society for Testing Materials. The other specifications and also the recommended practices for the preparation of various metals for plating, have been endorsed by the AES.

The use of these specifications and practices has been greatly facilitated by their publication in an ASTM booklet, "Specifications and Tests for Electrodeposited Metallic Coatings."

Committee B-8 in 1955 listed 178 members. The 1955 Year Book which does not recognize consulting members or duplicate representatives of individual companies, lists 129 members, of whom about half are listed as "general interest." This is a healthy recognition of the widespread interest in electroplating. At present, there are five major subcommittees, namely, I, on Specifications, Papers and Definitions; II, on Performance Tests; III, on Conformance Tests; IV, on Electroplating Practice; and V, on Supplementary Treatments for Metallic Coatings. Each of these has several sections. The meetings of the sections and subcommittees are well attended, especially when they are held separately from other ASTM meetings that may produce conflicting dates.

I will not attempt to discuss details of the recent or current activities of Committee B-8, many of which are presented as part of this symposium. The committee is especially to be congratulated on the vision shown in broadening its scope and activities so as to keep abreast of the expanding applications of electroplating.

I wish to pay tribute to the energy, devotion, and wisdom of those who have planned and guided the committee's activities since it was organized in 1941. To recognize all those individuals who have so ably contributed to its program would involve a list of almost all of the past and present members. I will, however, refer especially to some of the deceased members who gave their time and energy to this work, including C. L. Hippensteel, who was one of the earliest and most active proponents of a greater interest in electroplating by ASTM; George B. Hogaboom, one of the "ringleaders" who insisted that the ASTM should give more adequate consideration to electroplating; Edwin M. Baker, who was active in all the programs and was the first chairman of Committee B-8; and Carl Heussner, whose thoroughness and insistence on accuracy contributed so much to the programs and specifications; Richard M. Wick, who was especially active on Recommended Practices, and Thomas F. Slattery, who as AES president, fostered the cooperation with ASTM. It was a pleasure and a challenge to work closely with these persons.

Committee B-8 has been fortunate both in its choice of capable, enthusiastic officers, and in their retention for sufficient periods to ensure their acquaintance with and efficiency in their duties. The successive chairmen have been E. M. Baker, 1941–1943, when his untimely death through overwork on the Manhattan Project terminated his service; R. J. McKay, 1943–1947, who although now retired, has continued his active part in the work of the committee, for which he recently received an "award of merit;" and C. H. Sample, 1947–1955, who has rendered efficient service and has stimulated and supported the work of the subcommittees.

Similarly, there have been only three secretaries, namely,

Gustav Soderberg, 1941–1943, who is now back in Sweden, his native country, as a teacher and research director; C. H. Sample, 1943–1947, who then "graduated" to chairman; and R. B. Saltonstall, 1947–1955, who has been active and faithful in conducting the arduous duties of the secretary.

When I recall the hesitancy with which, in 1931, the ASTM leaders approved and embarked upon the cooperative research with the AES, I am deeply gratified that 25 years later these efforts have been so productive and successful. The status and stature of both the ASTM and AES have grown as a result of these efforts. This type of effective, cordial cooperation between two technical socities is a fine example that may well stimulate similar activities in other industries. It is especially valuable in showing that it is not necessary for different organizations to duplicate work on a given subject. Instead, let each group perform its major function, with sufficient overlapping of membership to ensure that each society helps the other in the achievement of their common goals. With this spirit, we may be sure that "the best is yet to be."

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Epoxy Resins

(*Continued from page 1431*)

that the alkyds do. Perhaps where no corrosive conditions exist, the alkyds are more to be desired in this respect. The epoxy esters are usually more costly than the alkyd types. The catalyzed epoxy resins have also found use in maintenance work where their superior resistance to solvents and highly corrosive chemicals are desired. Normally their use is confined to interior applications since this modification has the greatest tendency of the epoxy modification to chalk on exterior use which is often undesirable. It is possible to build up heavy film thicknesses without an excessive number of coats of paint; and because the mechanism of curing the catalyzed epoxy resins are by polymerization, true cure is obtained in heavy films without such defects as wrinkling.

B. Appliance Finishes

The epoxy modifications have found wide use in appliance finishes, particularly in undercoats. The development of the new types of detergents in the last few years have made it necessary to apply highly chemical resistant films to such things as home washers, and the epoxy resin modified with urea or melamine or in some cases with phenolic resins have filled a real need here. In general, the epoxy compositions develop too much color to be used as a vehicle for white appliance enamels. In appliance finishes, of course, only the baking types are used.

C. Chemical Resistant Finishes

The epoxy modifications are being used in all manner of applications where extreme chemical resistance is required. They are used in lining of drums, pails, pipe lines and railroad tank cars. Before the advent of epoxy resins, the heat hardening phenolics or the vinyls were used for this purpose. Usually the phenolic modifications of the epoxy are used and the films produced by baking have better adhesion and much better flexibility and resistance to impact than the straight phenolics. Compared to the conventional vinyl systems, the phenolic modified epoxy coatings have good chemical resistance, and of course much better solvent resistance.

D. Tin Decoration and Container Coatings

The epoxy resins, particularly the epoxy esters, have found use as coatings for tin and black iron where the metal is subsequently fabricated into articles such as screw caps. The epoxy coatings used here have good fabrication properties and subsequently are resistant to various processing procedures.

The epoxy resins have also found use in the interior of metal containers where they are in contact with beverages and other food products. In this application they are nontoxic and impart no flavor or taste. They are highly resistant to thermal decomposition such as occurs when a soldered side seam is necessary in the fabrication of the can.

A. F. Rylander graduated from the University of Illinois in 1930 with a BS degree in chemistry. Since that time he has been with the Pittsburgh Plate Glass Company, engaged in various aspects of protective coatings and is widely known for his work in that field. At the present time he is assistant technical director of the Milwaukee Paint Division of his firm.

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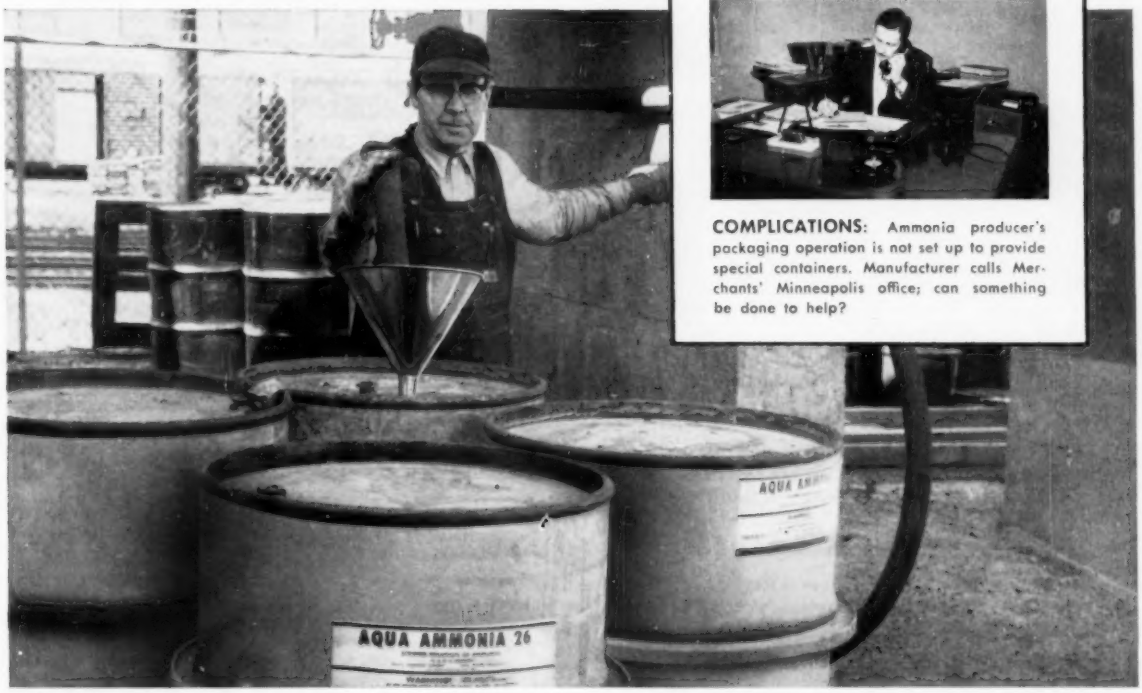

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The 43rd Annual Convention of the American Electroplaters' Society (AES) held in Washington this past June has passed into history with distinction. In ten educational sessions, more than any recent AES annual members' assembly, it produced 42 papers of high standard by some 70 authors or co-authors of competence and reputation. Each of these enrich the technical and scientific knowledge in the field of electroplating, metal finishing and allied arts.

So as to satisfy the thirst for technical and scientific knowledge of its 7200 members here and globally, the AES has published all these papers in book form together with their charts, diagrams, graphs and other illustrations, and with the verbatim discussion that followed their delivery.

Inasmuch as these convention papers will not this year also be published in PLATING MAGAZINE as in other years, this book is the only printed medium in which all of these 42 papers, and the prodigious wealth of technical and scientific knowledge that they impart, will be published.

This unique book, larger than any of its predecessors, totals 308 pages compared with the 255 of last year's edition. Its scope and coverage is demonstrated by its array of papers listed at left.

AES headquarters has received a number of inquiries from non-members regarding the availability of copies for purchase—and its market price.

Because of the stature of members' needs, only a comparatively limited quantity of TECHNICAL PROCEEDINGS still exists for sale to non-members. Out of a deep desire to be helpful to those non-members who recognize the book's import and value, *orders will be accepted and serviced by the AES on strictly a first-come first-served basis so long as its limited supply of* TECHNICAL PROCEEDINGS *lasts.*

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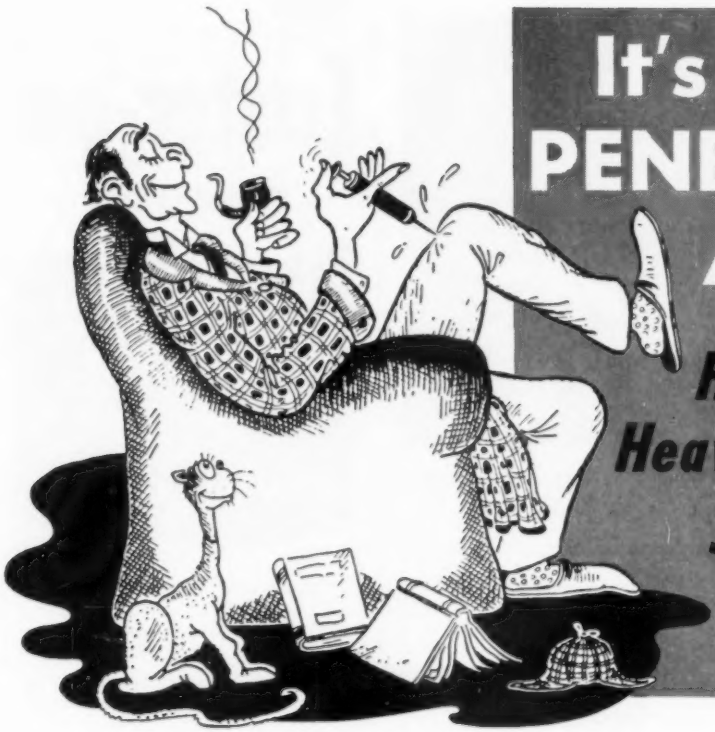

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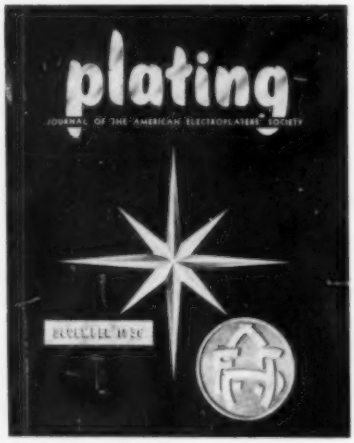

COVER—The guiding star of Christmas, symbol of the Holiday Season, forms the motif for the cover design.

Opportunity to Authors to have Technical Papers Appraised for Publication in PLATING

Authors of technical and scientific papers on electroplating, metal finishing and related arts are cordially invited to submit manuscripts of original, unpublished papers to the Editor of PLATING for review and publishing consideration.

Any such paper accepted and published in PLATING will also become eligible, of course, for selection by the Society's PAPER AWARDS COMMITTEE for the Carl E. Heussner Award, George B. Hogaboom Award, AES Bronze Medal Award, Robert S. Leather Award, Chromium Plating Award or the Precious Metal Plating Award.

Though the submission of any such papers by AES members or non-members will be welcomed by PLATING any time during the year, this current period is particularly recommended. So as to expedite review and other processing, please write the Editor, PLATING, 445 Broad Street, Newark 2, New Jersey, for full particulars before submitting your manuscript.

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BOOKS

Development of a Substitute or Improvement of Chromium Electrodeposits by J. E. Stareck, E. J. Seyb, Jr., and A. C. Tulumello. 161 pages; PB 121264; $4.25

This investigation reveals the close correlation between stress in a chromium deposit and the effect of such a deposit on the fatigue limit of high strength, hardened steel. The study showed that stress was more important than hydrogen embrittlement and notch effect. Numerous stress measurements were made with the "spiral contractometer" and "rigid flat strip" methods and the following conclusions were reached: stress in the chromium deposit is the primary determining factor in lowering the fatigue limit of chromium plated steel; stress in electrolytic chromium varies from high to low depending on the type of solution and the operating conditions; negative or compressive stress in the chromium plate is obtained with deposits possessing numerous crack lines; stress generally increases during baking; certain types of chromium deposits stress relieve during baking; any particular chromium deposit shows a characteristic fatigue limit beyond which it is largely independent of the strength of the steel but is determined by the chromium shell; chromium deposits with negative "as deposited" stress give high fatigue results unbaked; certain types of chromium deposits which stress relieve on baking give high fatigue results after the baking treatment. This knowledge led to development of baths and plating conditions which gave greatly improved fatigue properties.

Development of a Coating, Pretreatment for Metals (Wash Primer). 122 pages; PB 121362; $3.25

Army-sponsored development of a new one-package pretreatment coating for steel, aluminum and magnesium is described in a final report of research just released to industry through the Office of Technical Services, U. S. Department of Commerce.

A wash primer, Formula XP-7, with pigment composition of 50 per cent strontium chromate and 50 per cent zinc chromate produced the best corrosion inhibition and stability properties of more than 150 coating formulations examined. Polyvinyl butyral was superior among resins tested as vehicles.

XP-7 can be packaged in an ordinary paint can lined with phenolic or epoxy coating, according to the report. It requires no special mixing at the point of application and can be applied by brush, dip or spray. Production of XP-7 was recommended to replace a two-package, relatively unstable pretreatment coating in use by the Army.

A Basis for Forecasting Nickel Demand in the United States by Henry D. Lytton

The author, a market consultant and former government metals expert, states in his book that the true condition of the nickel market in 1956 is not indicated by consumption trends, and that predictions of an oversupply in the near future are unrealistic.

His outlook is based on the fact that industry adjusted demand and consumption levels to the supply it knew would exist. If the nickel supply was adequate steel production alone would use over 77,000 tons of virgin nickel, with all industry using a total of at least 165,000 tons.

In 1965, the steel industry will use 48,000 tons for the usual alloying, 5000 tons for jet engine type super alloys, 24,250 tons for recapturing markets in which nickel has been displaced, and 12,000 tons to accommodate minimum steel expansion, according to the author. This total of 89,250 tons added to expected demand of 98,500 tons for the non-steel markets, nonferrous alloys, electroplating, cast iron, ceramic, chemical and others, makes a total of 187,750 tons by 1965.

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A Timely Message on

Disappearing Manpower

by Ben P. Sax

Chairman of the Board, American Buff Company

Statisticians forecast a prolonged period in which all of us, in every industry, face an ever-toughening problem of shrinking labor pools. The situation demands new means and new ideas which can compensate for fewer hands.

It is heartening to review the closing year's progress in increasing the productivity of workers far beyond their previous limits. Our own Metal Finishing Industry has kept pace by the introduction of wonderful, new devices which enable workers to multiply their effectiveness many times over.

Automation in many forms not only is yielding important benefits to employers, but also is making possible continued operation of plants otherwise crippled by help shortages. Modern air-cooled buffs with safe, high speeds are cutting per-unit production costs and selling prices. This in turn creates increased product demand.

Improved types of buff materials are doing a giant job of slicing overhead in finishing operations on parts and products for consumer and industrial uses. New chemical miracles have produced sisal fibres with super workability and wider usefulness which contribute to overall savings. Our own company has perfected a system of pre-assembly for buffs, which cuts change-over and down-time to a tiny fraction of previous methods.

We at American Buff, feel that the Metal Finishing Industry is our family. Overcoming its handicaps is a personal challenge we have always assumed with enthusiasm. As we review the past year, we can count satisfying successes. With our thanks for your warm acceptance of our measures against manpower shortages, we extend our sincere wishes for your growing prosperity in the wonderful world of tomorrow.

Sincerely,

Ben P. Sax

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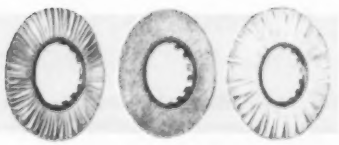

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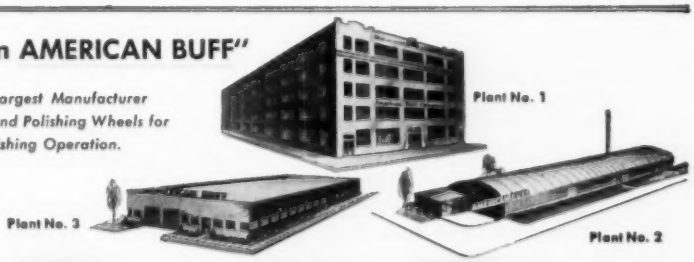

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PATENT ABSTRACTS

DR. D. GARDNER FOULKE
Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,750,309, June 12, 1956—Treatment of the Surfaces of Aluminum—A. Pullen and E. Swann, assignors to British Aluminum Co., LTD., London, England.

This method of cleaning aluminum consists of immersing the parts for a short period of time in an aqueous, alkaline solution which contains an alkali-metal hydroxide in an amount of between 1.8–3.5 per cent by weight, dissolved aluminum in an amount about equal to half the weight of alkali metal hydroxide to insure that a permanent deposit will appear in the solution, and the transform of dinitrotetrammine cobaltic chloride solution in the range of 0.01 to 0.3 per cent by weight. The temperature is given as 30°–50° C. The disclosure states that the presence of the cobalt ammine maintains the activity of the bath which normally falls off as the hydrous aluminum hydroxide builds up.

8 claims.

No. 2,750,332, June 12, 1956—Method and Apparatus for Electrodeposition of a Layer of Uniform Thickness on a Conductive Surface—R. Miller, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

The method describes the equipment for plating a surface made conductive, such as a mirror, by conveying the work piece past an electrodepositing station with a nozzle applicator attached to a supply tank for spraying solution on the cathode as it moves by. The work is the cathode and an anode is in the supply tank.

6 claims, 5 figures.

No. 2,750,333, June 12, 1956—Electrodeposition of Antimony and Antimony Alloys—C. Smart, assignor to General Motors Corp., Detroit, Michigan.

The bath consists essentially of an aqueous solution containing ammonium and citrate ions, antimony potassium tartrate and an alkali metal salt of ethylene diamine tetra acetic acid in a small but effective amount of to about 60 g/l. The addition of a metal other than antimony also claimed, e.g. lead, copper, tin, cadmium, iron, zinc and indium.

Claim 5 describes bath as:

80–200 grams of debasic ammonium citrate
10–80 grams of antimony potassium tartrate
30–60 grams of tetra sodium salt of ethylene diamine tetra acetic acid

10 claims.

No. 2,750,334, June 12, 1956—Electrodeposition of Chromium—H. Brown, assignor to the Udylite Research Corporation, Detroit, Michigan.

The improvement consists of adding to the solution a saturated fluorocarbon sulfonic compound in sufficient amount to substantially decrease the spray and mist, said compound having 4–18 carbons for each sulfonic group.

See also patent No. 2,750,335 describing the use of fluorocarbon amines or quaternary compounds and No. 2,750,336 in which baths containing compound of the formula H $(CF_2 \cdot CF_2)_x$ $(CH_2)_y$ ZM are claimed and No. 2,750,337 in which the use of picolines and pyridine with the fluoro compounds is disclosed. These patents have 5, 10 and 9 claims, respectively.

18 claims.

No. 2,750,338, June 12, 1956—Electrolytic Manganese—M. Carosilla, assignor to Union Carbide and Carbon Co., New York, New York.

The electrowinning of manganese in a diaphragm cell is described from an aqueous electrolyte containing manganese and ammonium sulfate and an effective amount of sulfur dioxide. The ammonium sulfate to manganese concentration in between 7:1 and 12:1 and the improvement consists in adding boric acid to the catholyte feed in sufficient amount to provide a concentration of 2 to 15 g/l.

3 claims.

No. 2,750,339, June 12, 1956—Method for Inhibiting Corrosion—F. Steinhauff, assignor to Esso Research and Engineering Co., Elizabeth, N. J.

Reduction of corrosion of ferrous metals by aqueous acid media may be effected by adding to the solution the reaction product of an alkylene 1° polyamine and a polycarboxylic acid (by-product from the preparation of sebacic acid from castor oil).

14 claims.

No. 2,750,897, June 19, 1956—Loading and Unloading Apparatus—S. Davis, assignor to the Udylite Corp., Detroit, Michigan.

A transfer device for loading and unloading conveyors is described.

5 claims, drawing.

No. 2,751,311, June 12, 1956—Aluminizing—L. Rosseau, assignor to Ajax Electric Co., Philadelphia, Pa.

A method for selectively coating objects by the hot dip method is described. A bath of molten aluminum is covered by a flux and a second body of molten aluminum is brought into contact with the work after the article is immersed in the flux.

4 claims, figure.

No. 2,751,340, June 19, 1956—Method of Plating—R. Schaefer, et al, assignors to Clevite Corporation, Cleveland, Ohio.

There is described a method of cathode shield plating to produce a uniform layer of metal upon the concave circumferential surface of flanged semi-cylindrical shaped articles is described. The patent refers particularly to plating bearings and can best be understood by consideration of the figures.

6 claims, 6 figures.

No. 2,751,341, June 19, 1956—Electrodeposition of Lead and Lead Alloys—C. Smart, assignor to General Motors Corp., Detroit, Michigan.

The bath consists essentially of an aqueous solution of sodium potassium tartrate, lead acetate, and the tetra sodium salt of ethylene diamine tetra acetic acid in an amount sufficient to complex the lead. Claim 2 gives a composition as:

5–120 g/l sodium potassium tartrate
5–15 g/l lead acetate
20–40 g/l EDTA

10 claims.

No. 2,751,342, June 19, 1956—Polishing of Aluminum—K. Gugzenberger, assignor to Fromson Orban Co., Inc., New York, New York.

This electropolishing bath for aluminum consists of 600–1750 g/l of sulfuric acid and 3 g/l of chromic acid up to the saturation point. Bath temperature is given as 50–100° C and the current density is 15–80 amperes per square decimeter at 8–24 volts.

7 claims.

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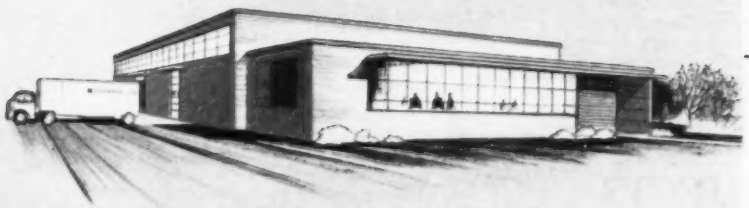

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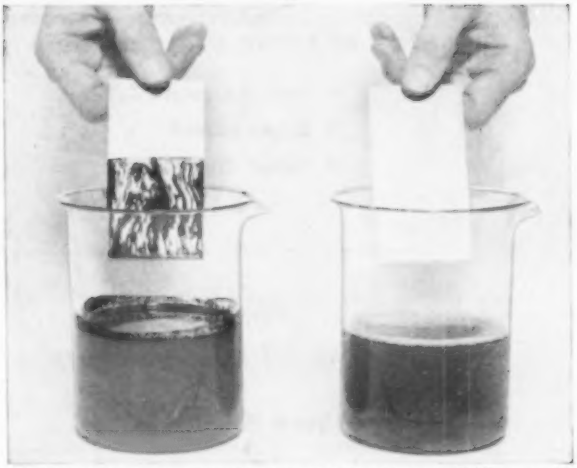

WHY YOU MAY BE GETTING TOO MANY REJECTS. *Difference in rinsing properties of two cleaners is clearly shown above. Beaker at left contains a conventional cleaner in general use. Beaker at right contains a solution of Diversey 909 Heavy Duty Cleaner. Identical amounts of grease and dirt are added to each beaker. Notice how soil clings to metal strip inserted in conventional cleaner, while work dipped in Diversey 909 at right is free of waterbreaks.*

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PATENT ABSTRACTS

No. 2,751,345, June 19, 1956—Electroplating Rack—M. Osman, assignor to Radio Corporation of America.

A rack is described which permits the preplating and electroforming of phonograph records without removal and masking between the two steps. This is done by using said adjustable rack.

8 claims, 9 figures.

No. 2,752,306, June 26, 1956—Production of Drinking Water—W. Juda and W. McRae, assignors to Sonics, Inc., Cambridge, Mass.

This method of producing demineralized water by treating a chloride bearing water with an anion and cation permeable membrane also provides an aseptic water by supplying sufficient anodic potential, over and above that normally supplied the membranes, to liberate chlorine.

5 claims, figure.

No. 2,752,308, June 26, 1956—Cathodically Protected Water Storage Tank—O. Andrus, assignor to A. O. Smith Corp., Milwaukee, Wisconsin.

A water storage tank is described which is cathodically protected by an outside source of current, the circuit being designed so that when the water falls below a control electrode the impressed current will be shut off.

1 claim, figure.

No. 2,754,258, July 10, 1956—Gold Alloy Plating—S. Taormina, et al, assignors to Platers Research Corporation, New York, N. Y.

More abrasion resistant gold alloys are claimed when a 90–95 per cent gold alloy contains 0.05 to 5 per cent uranium or molybdenum. The plating bath may be a gold cyanide bath (4 g/l Au) and free KCN of 4 g/l) containing potassium molybdate or uranyl nitrate.

10 claims.

No. 2,755,199, July 17, 1956—Hard Coated Composite—D. Rossheim and U. Jelnek, assignors to M. W. Kellogg Co., Jersey City, New Jersey.

Metals, metal carbides, metal nitrides and metal borides with melting points above 3000° F in subdivided form are placed upon steel and while under pressure a current, 1/2 to 2 volts and 90–110 amperes is impressed to fuse the bulk of the fine particles and the surface portions of the larger particles.

2 claims, figure.

No. 2,755,210, July 17, 1956—Treating Steel to Promote the Adherence of Porcelain Enamel—F. Sutphen, et al, assignors to Armco Steel Corp., Middletown, Ohio.

Nickel, cobalt or mixtures of both are deposited on the surface of the steel, then the article is subjected to a scale anneal for 2 to 5 minutes. Then the scale formed is pickled off in acid.

22 claims.

No. 2,755,237, July 17, 1956—Electrolytically Etched Condenser Electrode—T. Turner, assignor to Sprague Electric Co., North Adams, Mass.

To obtain a greater effective surface area than the original dimensions of the surface 99.88 per cent pure aluminum is heated to 500° C and up to just below it melting point to orient the 200 planes to the foil surface, then is electrolytically etched within 2 hours at a lower temperature in an aqueous halide bath. See also No. 2,755,238 (6 claims).

8 claims, figure.

No. 2,755,239, July 17, 1956—Sealing Baths—W. Glauser, et al, assignors to J. R. Geigy A. G., Basel, Switzerland.

An improvement in the hot water sealing of anodized aluminum is claimed when a water soluble formaldehyde condensation of an aromatic sulfonic acid (as an example see U. S. patent No. 1,336,759) is added to the bath along with cobalt or nickel ions.

2 claims.

No. 2,755,240, July 17, 1956—Electrolysis of Titanium Tetrachloride—W. Normore and A. Scobie, assignors to Shawinigan Water and Power Co., W. Montreal, Canada.

The electrolysis of titanium tetrachloride in fused salt baths consisting essentially of alkali metal chlorides and alkaline earth chlorides is carried out in the presence of a fluoride salt in the proportion of 0.02 to 0.1 per cent to prevent polarization.

17 claims.

No. 2,755,242, July 17, 1956—Treatment for Chromium Plated Aluminum—F. Keller and W. Zellay, assignors to Aluminum Company of America, Pittsburgh, Pa.

To improve the resistance to corrosion of an aluminum article having a porous chromium electrodeposit, the article is made the anode at a potential of at least 5 volts in an aqueous solution consisting essentially of water and up to 1 g/l of chromic acid for at least 1/4 minute. The second claim describes the voltage as 20 to 80 and the chromic acid content as 0.01 to 0.1 g/l.

2 claims.

No. 2,755,537, July 24, 1956—Electroplated Article—C. Smart, assignor to General Motors Corp., Detroit, Michigan.

The inventor claims a metallic structure comprising a metal base, a first layer of lead, indium or an alloy of lead and indium, a second layer containing an alloy of lead and antimony and third layer of antimony the thicknesses being, respectively, 0.00001 to 0.0001 inch, 0.0005 to 0.0015 inch and 0.0005 to 0.0015 inch.

10 claims, figure.

No. 2,756,200, July 24, 1956—Porous Article Impregnation—H. Houck, assignor to General Motors Corp., Detroit, Michigan.

To impregnate a porous metal article with a cupreous metal the article is plated with cupreous metal by electroplating, metal or metal powder (with binder) spraying, after which the article is heated and the copper is drawn into the pores of the article by capillarity when the copper or copper alloy becomes liquid.

4 claims.

No. 2,756,205, July 24, 1956—Making Tubing Continuously by Electrodeposition—G. Rosenquist, Calumet, Michigan.

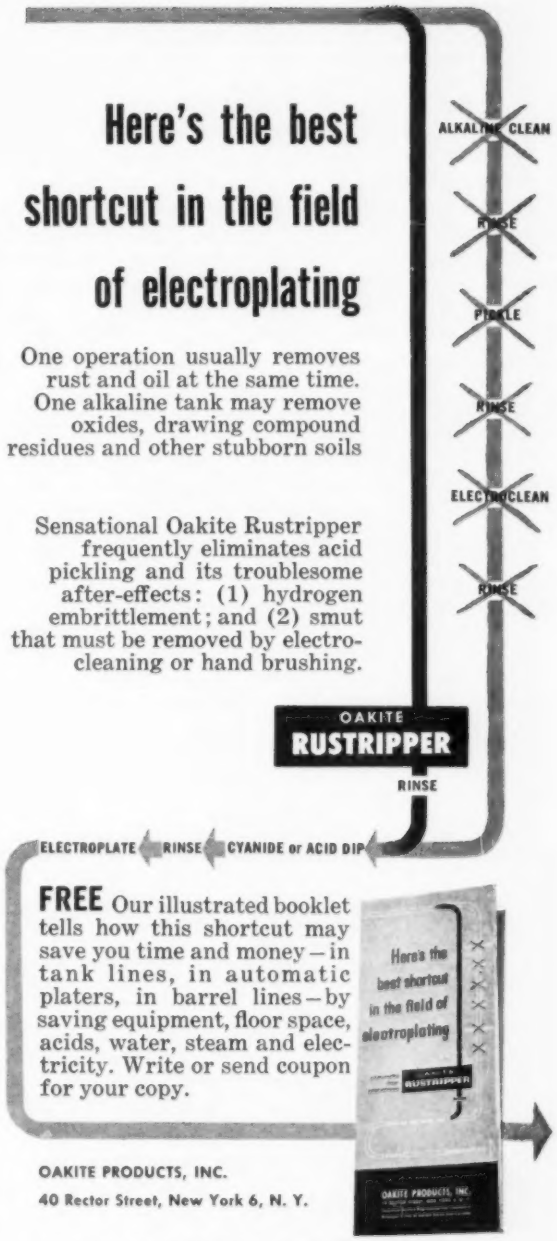
In six claims and 8 figures an apparatus is described whereby tubing can be electroformed continuously.

6 claims, 8 figures.

No. 2,760,890, August 28, 1956—Method of Producing Corrosion Resistant Metal Coating—J. Kosmos, assignor to The Chemical Corporation, Springfield, Mass.

A bath for imparting corrosion resistant films to copper and magnesium surfaces consists essentially of a solution of 300 grams of sodium bichromate, 132 grams of nitric acid, 180 grams of glacial acetic acid and 52.4 grams of sodium chloride in water, said water being added in the amount of 1 to 100 times the volume of the solution.

5 claims.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PATENT ABSTRACTS

No. 2,760,891, August 28, 1956—Protective Coating for Metal Parts—V. Nichols, assignor to Borg Warner Corp., Chicago, Illinois.

A protective coating for brass, copper, zinc, steel, aluminum and cadmium surfaces is obtained by immersing said surfaces in a solution consisting of 150 to 600 grams CrO_3, 85 to 170 grams 66° Be′ sulfuric acid, 43.4 to 130.2 grams of nitric acid and not more than 22.5 grams of single nickel salts per liter of water.

3 claims.

No. 2,760,921, August 28, 1956—Test Pencil—Martin Pollack, Brooklyn, New York.

A test pencil for determining the correct amount of free cyanide in the bath and/or the proper operation of the bath. The pencil is essentially zinc (80–90 per cent Zn, 1–10 per cent Al and 0.1–5.0 per cent Cu) and, when immersed into a cyanide bath, the type of deposit obtained indicates the condition of the bath.

2 claims, 4 figures.

No. 2,760,923, August 28, 1956—Apparatus for Reverse Current Protection of Anodes in Electropickling—L. Bogushi, assignor to Republic Steel Corp., Cleveland, Ohio.

An apparatus and method is claimed whereby racks carrying anodes as well as work pieces move through the pickling (acid dip) tank prior to plating. In the case of zinc considerable solution occurs. By making the rack anodic in the pickle and the zinc anodes cathodic, the racks are stripped and little loss of zinc from the anode occurs.

2 claims, 3 figures.

No. 2,760,924, August 28, 1956—Method of Polishing Stamped Steel Articles—G. Troendly, assignor to Autoyre Co., Inc., Oakville, Connecticut.

Claim No. 1 states, "The method of polishing articles stamped from relatively low carbon steel which consists in carburizing the articles for a period sufficient to produce a continuous carburized layer thereon having a thickness of approximately .005″ to .006″, quenching said articles to harden said continuous carburized layer, tempering the articles to reduce the hardness of said continuous layer to a value less than that obtaining following the quenching step and greater than that of the articles prior to carburizing, and thereafter tumbling said articles together in a tumbling barrel with an abrasive."

3 claims.

No. 2,760,925, August 28, 1956—Method for Surfacing Aluminum—A. Bryant, assignor to Grove Valve and Regulator Co., California.

The method consists of laying down a hard anodized layer upon the aluminum, washing and drying, then applying finely divided molybdenum disulfide dispersed in a silicone lubricant.

1 claim, 2 figures.

No. 2,760,929, August 28, 1956—Electroplating Apparatus—G. Shepard and R. Avellone, assignors to Republic Steel Corporation, Cleveland, Ohio.

An improved rack for plating hollow articles and carrying consumable anodes is described.

8 claims, 5 figures.

No. 2,762,115, September 11, 1956—Protecting Hot Extruded Metal—N. V. Gates, assignor to American Brass Co., Waterbury, Conn.

The hot extruded shape as it emerges from the die is brought into contact with an alkyl borate vapor which thermally decomposes and the product thereof protects the shape from corrosion.

4 claims, 2 figures.

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ARTICLE REFERENCES

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Most of the articles listed here may be obtained by writing to the Publication. Addresses are included for the reader's convenience.

Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

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179. ADHESION

a. *PLATING ADHESION: WHICH TEST DO YOU BUY?*
P. M. Unterweiser.
The Iron Age, *178*, No. 16, October 18, 1956, p. 123–125.

180. ALUMINUM

a. *SURFACE TREATMENT AND FINISHING OF LIGHT METALS. PART XI. PROPERTIES OF ANODIC COATINGS.*
S. Wernick and R. Pinner.
Metal Finishing, *54*, No. 10, October 1956, p. 66–69.

b. *TECHNIQUES FOR SURFACE TREATMENT OF ALUMINUM.*
Henry Walker.
Products Finishing, October 1956, p. 44–54.

c. *FINISHES FOR ALUMINUM ALLOYS. PART I. ELECTROLYTIC OR ANODIC COATINGS.*
Walter E. Pocock.
Metal Progress, *70*, No. 4, October 1956, p. 75–78.

181. ANODE STRUCTURE

a. *ELECTRON MICROSCOPE STUDIES ON COPPER ELECTRODES IN SULFATE BATH CONTAINING ADDITION AGENT.*
Shinzō Okada, Saburō Magari and Kentarō Katsui.
Journal of the Electrochemical Society, *103*, No. 10, October 1956, p. 557–561.

b. *ELECTRON MICROSCOPE STUDIES OF COPPER ANODES OBTAINED IN SULFATE AND CYANIDE BATHS.*
Shinzō Okada, Saburō Magari and Kentarō Katsui.
Journal of the Electrochemical Society, *103*, No. 10, October 1956, p. 553–557.

182. BARREL PLATING

a. *BARREL PLATING EQUIPMENT.*
J. B. Mohler.
Metal Finishing, *54*, No. 10, October 1956, p. 61–65.

183. CHROMIUM

a. *CHROMIZING OF STEEL.*
E. Gasior.
Henry Brutcher, Translation No. 3708, 13 p. (Condensed from Prace Imh., v. 7, 1955, p. 1–10). Henry Brutcher, Altadena, Calif.

b. *CHROMIUM PLATING OF CUTTING TOOLS.*
M. E. Gol'dshtein and V. M. Fridenson.
Henry Brutcher, Translation No. 3720, 7 p. (from Stanki i Instrument, v. 26, no. 7, 1955, p. 26–28). Henry Brutcher, Altadena, Calif.
"Complete procedure for the controlled chromium plating of various tools to a thickness of 2–3 microns."

184. CLEANING

a. *CLEANING METALS AND ALLOYS.*
C. B. F. Young.
Metal Finishing, *54*, No. 10, October 1956, p. 57–60.

185. CORROSION

a. *AQUEOUS CORROSION OF ALUMINUM. PART 2. METHODS OF PROTECTION ABOVE 200 C.*
J. E. Draley and W. E. Ruther.
Corrosion, *12*, No. 10, October 1956, p. 20–30.

b. *GASEOUS SYSTEM OF CORROSION CONTROL. TURBO-JETS PROTECTED BY VPI.*
Corrosion Technology, *3*, No. 9, September 1956, p. 293–294.

186. CURRENT DISTRIBUTION

a. *NEW DESIGN OF AN ELECTROLYTIC CELL FOR THE STUDY OF ELECTROPLATING PHENOMENA.*
Roger Gilmont.
Journal of the Electrochemical Society, *103*, No. 10, October 1956, p. 549–552.

187. ELECTROPLATING

a. *'DALIC' DEPOSITION AT SEA.*
Corrosion Technology, *3*, No. 9, September 1956, p. 284–285.

188. EMBRITTLEMENT

a. *WHAT DO WE KNOW ABOUT HYDROGEN IN STEEL?*
C. R. Simcoe.
The Iron Age, *178*, No. 15, October 11, 1956, p. 102–105.

189. ETCHING

a. *METAL MILLING BY A CHEMICAL ETCH.*
C. Fred Gurnham.
Products Finishing, October 1956, p. 58–68.

190. INSPECTION

a. *ETCH PENETRANT PINPOINTS CASTING SURFACE DEFECTS.*
G. Tyler.
The Iron Age, *178*, No. 18, November 1, 1956, p. 96–97.

191. LEVELING

a. *LEVELING NICKEL.*
D. Gardner Foulke.
Metal Finishing, *54*, No. 10, October 1956, p. 52–56.

192. MEASUREMENT

a. *HOW TO APPRAISE ACCURACY IN MEASUREMENT.*
Col. W. J. Darmody.
American Machinist, *100*, No. 22, October 22, 1956, p. 130–136.

193. NICKEL

a. *OF NICKEL ATOMS, IONS AND ELECTRONS.*
W. A. Wesley.
Institute of Metal Finishing, Bulletin, V. 6, Summer 1956, p. 87–106.

194. PERMEABILITY

a. *PERMEATION OF GASES THROUGH NICKEL DEPOSITS. I. DETERMINATION OF THE INTRINSIC PERMEABILITY OF NICKEL DEPOSITS TO GASES.*
D. T. Ewing and J. Martin Tobin.
Journal of the Electrochemical Society, *103*, No. 10, October 1956, p. 545–548.

195. RHODIUM

a. *SOME EXPERIMENTAL AND PRACTICAL ASPECTS OF HEAVY RHODIUM PLATING.*
F. H. Reid.
Institute of Metal Finishing, Bulletin, V. 6, Summer 1956, p. 107–142.

196. STRESS

a. *RESIDUAL STRESSES IN ELECTRODEPOSITS.*
A. T. Vagramyan and Yu. S. Tsareva. Henry Brutcher, Translation No. 3749, 13 p. (From Zhurnal Fizicheskoi Khimii, v. 29, no. 1, 1955, p. 185–193). Henry Brutcher, Altadena, Calif.
"Critical review of theories of residual stresses in electrodeposits. Phenomenon studied by the automatically recorded cathode flexure method."

197. ULTRASONICS

a. *THE EFFECT OF ULTRASONICS ON ELECTRODEPOSITION OF METALS.* (*German*).
A. Roll.
Metalloberfläche, *10*, No. 8, August 1956, p. 230–233.
"Qualitative and partly quantitative determination of the effects of ultrasonics at various frequencies on electroplating with nickel, silver and chromium."

b. *CLEANING WITH ULTRASONICS BY USING MAGNETOSTRICTION OSCILLATORS.* (*German*).
H. J. Collmick and K. Tesser.
Metalloberfläche, *10*, No. 8, August 1956, p. 233–237.
"Ultrasonics with frequencies between 20 and 30 kc., emitted by sheets of nickel with effective oscillation surfaces varying from 70 sq. cm. to several hundred sq. cm., as the most effective and easily applicable cleaning method in industry."

Following are the addresses of the publications named in the Article Reference above.

Requests for articles should be made directly to the publication.

American Machinist
330 West 42nd St.
New York 36, N. Y.

Corrosion
1061 M & M Building
1 Main St.
Houston 2, Texas

Institute of Metal Finishing Bulletin
32 Gt. Ormond St.
London, W.C. 1, England

Iron Age
Chilton Co., Inc.
100 East 42nd St.
New York 17, N. Y.

J. Electrochemical Society
216 W. 102nd St.
New York, N. Y.

Metal Finishing
381 Broadway
Westwood, N. J.

Metal Progress
7301 Euclid Ave.
Cleveland 3, Ohio

Metalloberflache
Carl Hanser Zeitschriftenverlag GmbH
Leonhard-Eck-Strasse 7
Munich 27, Germany

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Gardner Publications, Inc.
431 Main St.
Cincinnati 2, Ohio

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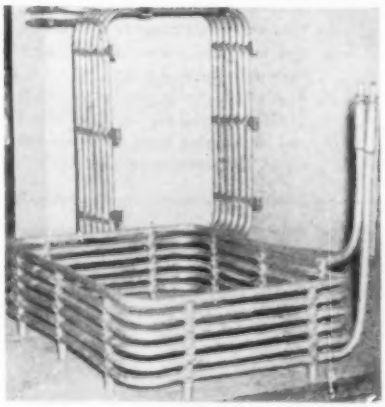
EDUCATIONAL SESSION AND DINNER DANCE

The Educational Session, to be held in conjunction with The Cleveland Branch Annual Dinner Dance on January 12, 1957 at the Hotel Carter, will deal with problems associated with aluminum and the plating of aluminum.

The papers to be presented are: "Chemical Treatment of Aluminum Surfaces for Corrosion Resistance" by F. P. Spruance Jr., American Chemical Paint Co.; "Causes for Peeling and Blistering of Electroplated Coatings on Aluminum" by Dr. Walter R. Meyers, Enthone Inc.; "Plating and Anodizing of Aluminum Alloys," speaker from ALCOA.

The Dinner Dance will start at 7:30 PM. Reservation cards can be obtained from the Branch Secretary, Robert Peters, Heil Process Equipment Corp., 12901 Elmwood Ave., Cleveland 11, Ohio. The Cleveland Branch extends a cordial invitation to all AES members and their friends.



Quality never varies in Storts coils

Although they are made in a never ending variety of designs to fit the requirements of as many different tanks and containers, Storts coils never vary in quality. Storts coilmen have the facilities and the skill in bending, looping and spiraling to assure delivery of all that you need for efficient coil performance.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

FORD MOTOR COMPANY and National Association of Metal Finishers (NAMF) officials conferred in Dearborn, Michigan recently to inaugurate NAMF-industry liaison plan authored by NAMF President John Palik, Jr. (fifth left). Others shown are left to right: H. N. Bogart, manufacturing engineer, Ford; Glen H. Friedt, Jr., NAMF; H. Joy, purchasing agent, Ford; H. G. Ward, director of purchasing, Ford; Mr. Palik; H. R. Rourke, purchasing agent, Ford; Bud Adelsperger, NAMF; and Attorney James D. Mueller, NAMF

200 Papers Given at ASTM 2nd Pacific Meeting

The Second Pacific Area National Meeting of the American Society for Testing Materials held in Los Angeles, September 17 to 21, covered practically all kinds and types of engineering materials. During the five-day meeting more than 200 papers were presented at 43 technical sessions.

The technical program was the largest ever developed by the Society. In addition to the sessions at which papers were presented 13 technical committees held about 125 committee and subcommittee meetings.

Plastics Engineers Plan Technical Conference

Some 68 advanced technical papers are to be presented at the next Annual National Technical Conference of the Society of Plastics Engineers, scheduled to be held at the Sheraton-Jefferson Hotel in St. Louis, Missouri for three days beginning January 16, 1957.

STATEMENT OF PRINCIPLES BY THE PLASTICS INDUSTRY

Plastic materials challenge industry with new concepts of design, engineering, construction, processibility and usefulness.

The properties of plastic materials, when correctly used, open up great new areas of service to industry and the public.

Improper use can do irreparable damage to the plastics industry, to both manufacturers and processors of the materials.

Therefore, we as manufacturers and processors of plastic materials reaffirm our adherence to the principles upon which the healthy growth of a great industry depends and undertake to:

I. Understand thoroughly the properties and limitations of all plastic materials handled by us;

II. Apply the correct plastic materials to all industrial end uses, designing and engineering them for maximum value, performance and safety;

III. Use great care to select the correct plastic materials for all consumer items, designing and engineering them to insure value, satisfaction, safety and pleasure to all users;

IV. Sell plastic materials, and all industrial and consumer items made therefrom, on the merits of the materials, applications and design, and free of extravagant, insupportable claims.

All to the end that plastic materials already available, and others that may come; will bring to industry and public alike all the benefits, economies and satisfactions inherent in these versatile engineering and construction materials.

Signed by:

Manufacturing Chemists' Association, Inc.
The Society of Plastics Engineers, Inc.
Proprietary Plastics Manufacturers Association
The Society of the Plastics Industry, Inc.
Plastic Coatings and Film Association

Dr. Hellmuth Fischer, Professor of Electrochemistry at Technisch Hochschule, Karlsruhe, Germany, was the principal speaker at the Annual Joint Session of the AES's Detroit Branch and the Detroit Section of the Electrochemical Society held recently in Detroit. Dr. Fischer, holding notes, with (left) Webster B. Knight, a National Association of Metal Finishers' vice president; Dr. Gerald V. Kingsley, chairman, Detroit Section, Electrochemical Society; and (right) Howard J. McAleer, president, of the AES Detroit Branch

Chicago to be Scene of World Metallurgical Congress

A total of 68,379 visitors attended the 38th National Metal Exposition and Congress in Cleveland October 8–12, placing a reportedly high volume of buying orders with the record 473 exhibitors who occupied 250,000 square feet of Public Hall floor space, according to William H. Eisenman, managing director and national secretary of the sponsoring American Society for Metals.

American Society for Metals officials report having booked all space originally laid out for the 10th Western Metal Congress and Exposition next March 25–29 in Los Angeles. They are laying out additional exhibit areas.

The coming World Metallurgical Congress will be staged in Chicago next year, November 2 to 8, according to a joint statement by A. O. Schaefer, retiring Society president and W. H. Eisenman.

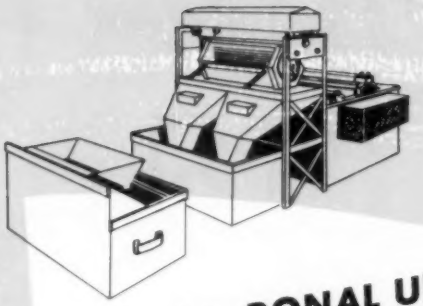
NAMF Questionnasre

A questionnaire has been sent from the headquarters of the National Association of Metal Finishers to its members to determine nationwide plating shop capacities and potentials.

Information is sought on the number of employees, plating solutions, amperage, work space, equipment, storage space, shipping facilities, expansion potential, and other pertinent data. Upon completion, the survey will be used to inform manufacturers, corporate and governmental, of the capacities and potentials of plating firms.

INDICATE B 1201 ➤

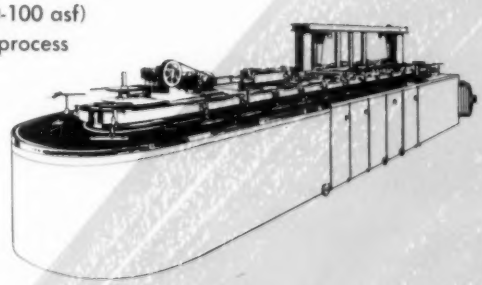
Lea Copper-Glo has a new partner



LEA-RONAL Ultra-Tartral combined with LEA Copper-Glo means that LEA-RONAL High Speed Bright Copper Process is so vastly improved as to be practically a new process.

Here are a few of the new features this new combination will give you:

- freedom from burning in spite of much higher current density
- 50 to 100 percent higher current density (Hull Cell 0-100 asf) over that *permissible* in any former cyanide copper process without reduction of *efficiency*
- higher free cyanide content permitted without loss of efficiency
- sodium cyanide may be used with higher current densities than is possible with an equivalent potassium *formulation* without Ultra-Tartral; this means real economy
- improved anode corrosion
- carbonate tolerance is even greater than ever before; no need to control carbonate.



This new and improved LEA-RONAL High Speed Copper Plating Process offers so much in the way of improved operations and economy that you should make at least a trial run. We suggest that you set aside one tank or section for comparative tests. Our technical staff can recommend a formulation for converting your present cyanide bath to this improved LEA-RONAL Process.

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serving the Finishing Field
The Lea Mfg. Co., Waterbury, Conn.
Lea-Michigan, Inc., Detroit
Lea-Ronal, Inc., Jamaica, N. Y.
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Lea Mfg. Co., of England, Ltd.
Plating Polishing Buffing Burring

High Speed Bright Copper Process is a LEA-RONAL INC. Process

On this particular Lea-Ronal Process all inquiries should be directed to:

THE LEA MANUFACTURING CO.
16 CHERRY AVE., WATERBURY 20, CONN.

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ULTRA-TARTRAL

A new concept in Cyanide Copper Plating which:

- ★ Increases allowable cathode current density.
- ★ Eliminates or reduces burning.
- ★ Makes baths simpler to control.
- ★ Eliminates carbonate control.

ULTRA-TARTRAL

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ROCHELLE SALTS

ULTRA-TARTRAL is another Lea-Ronal major improvement in cyanide copper plating.
ULTRA-TARTRAL is a major improvement over the prior old fashioned type of Rochelle Salts and Rochelle Salts substitutes.

1. **ULTRA-TARTRAL** raises the allowable operating cathode current density with *FREEDOM FROM BURNING*. It no longer becomes necessary to worry about high current density corners or edges.
2. **With ULTRA-TARTRAL** the cyanide copper bath becomes less sensitive to variations of concentration in free cyanide or copper cyanide. With the Lea-Ronal Bright Plating Process it permits operation with either lower metal concentrations for the potassium formulation or substituting the less expensive sodium cyanide in the sodium formulation.
3. **ULTRA-TARTRAL** makes carbonate control a thing of the past. It completely eliminates costly carbonate removal treatments.
4. **ULTRA-TARTRAL** costs no more to use than Rochelle Salts yet it gives you so much more.

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237 East Aurora Street, Waterbury 20, Conn.

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BOOKS AVAILABLE AT AES HEADQUARTERS

Deteriorations of Materials—
Causes and Preventive Techniques

Edited by G. A. Greathouse and C. J. Wessel
Nonmembers $12.00 AES Members $10.20

Water Supply and Waste-Water Disposal

by G. M. Fair and J. C. Geyer
Nonmembers $15.00 AES Members $13.00

Industrial Wastes, Their Treatment and Disposal

Edited by W. Rudolfs
Nonmembers $9.50 AES Members $8.10

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Rheinhold Publishing Company has announced an increase in their book prices, effective January 1, 1957. Orders received prior to that date will be honored at present prices.

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PRICES FOR ELECTROPLATING SUPPLIES

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COPPER

Cast elliptical, 18 inches or longer, 5000 lb lots 57.42

Electrodeposited 45.28

BRASS, 80-20, ball anodes, 2000 lb or more .. 58.00

ZINC, ball anodes, 2000 lb lots 21.25
(for elliptical add 2¢ per lb)

NICKEL, 99 pct plus, rolled carbon 90.50
(rolled depolarized add 3¢ per lb)

CADMIUM $1.70

TIN, ball anodes and elliptical ..... $1.06 to $1.10

(Cents per lb, freight allowed in quantity)

Primary Metals

GOLD, U. S. Treas., per oz $35.00

INDIUM, 99.9 per cent, per oz $2.25

LEAD, New York, cents per lb 16.00

PALLADIUM, per troy oz ..... $23 to $24

PLATINUM, per troy oz ..... $103 to $105

RHODIUM, dollars per oz ..... $118 to $125

SILVER, New York, cents per troy oz 91.375

Chemicals

CADMIUM OXIDE, 100 lb drum 1.70

CAUSTIC SODA, 100–300 lb drums 1.12

CHROMIC ACID, flake type, 1 to 20 100 lb drums 29.25

COPPER CYANIDE, 100 lb drum 80.50

COPPER SULFATE, 5 or more 100 lb bags, per cwt 20.65

NICKEL CHLORIDE, freight allowed, 300 lb. 43.50

NICKEL SALTS, single, 4-100 lb bags 38.25

NICKEL SULFATE, 100 lb (eastern delivery price) 38.25

POTASSIUM CYANIDE, 100 lb drum N. Y. 48.00

POTASSIUM STANNATE, 100 to 300 lb drums 1.12

SODIUM CYANIDE, domestic, f o b N. Y., 200 lb drums 21.55

SODIUM STANNATE, 100 to 600 lbs 67.40

ZINC CYANIDE, 100 to 900 lb 55.55

(Cents per lb, f o b at point shipped)

Prices in effect November 13, 1956

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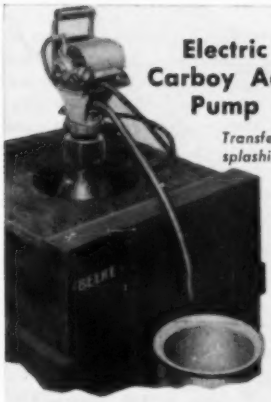
If you don't find it here — write.

Electric Carboy Acid Pump



Transfers quickly, — safely — no splashing or blurping.

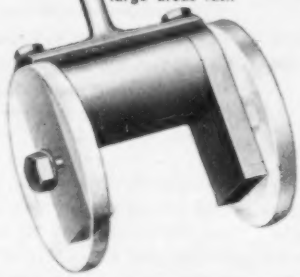
Self sealing rubber connector fits into carboy like a cork. Forces acid out in even flow. Air Safety Valve Lever stops flow instantly. Fits all standard 13 gal. carboys. Easily adapted to 6½ and 5 gal.

With lead tubing $81.40

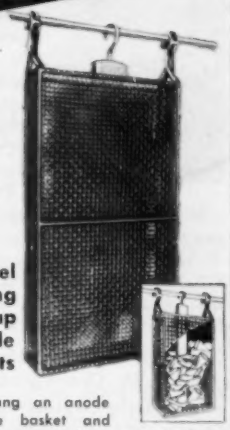
With plastic tubing 86.90

Permanent Tank Magnets

Pick up work from bottom of tank—also work clinging to plating barrels. Picks iron and steel chips from brass, copper, zinc, sawdust, etc. Available with or without wheels. Also assembled in "gangs" to cover large areas fast.



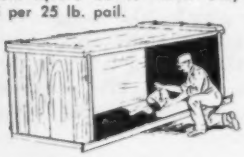
Nickel Saving Scrap Anode Baskets



Merely hang an anode inside the basket and pour the scrap anodes around it. Ruggedly made—insulated. Specify length, width and depth when ordering.

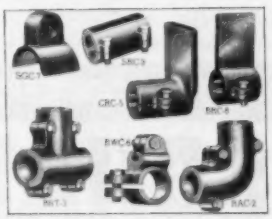
Easy to apply Rubberite Tank Lining

Make a lasting lining that protects wood or metal tanks from acids and alkalies at room temperatures. Easily applied right in your plant. Just heat and pour on to thickness desired. Will not crack, scale or peel in hottest weather. Very economical. 2 pounds lines one square foot ¼" thick. Only $4.75 per 25 lb. pail.

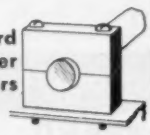


Cast Copper Bus Bar Connectors

All shapes and sizes
Order by number and specify diameter of openings

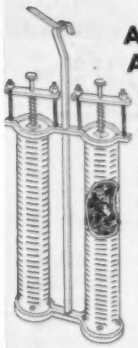


Hard Rubber Insulators



For 1" or 1¼" rods $1.95
For 1½" rods,..... 2.20
For 2" rods,..... 5.50

Aluminum Parts Anodizing Rack



Fast loading — time saving. For rivets, bolts, washers and other small aluminum parts. Just pour parts into the tubes and insert plunger. Spring tension makes positive contact between parts. Standard tubes are 22½" long, 2½" O.D.

Newest Style Ball Anode Baskets

For round or flat top anodes. No lodging. Heavy gauge steel, welded.

Dim. A	Dim. B	Price each
16"	4"	$1.15
20"	4"	1.20
25"	5"	1.40
31"	5"	1.55

Other dimensions to order.

Fast Loading and Unloading Racks for Chrome Plating Screws, bolts, rivets, etc.

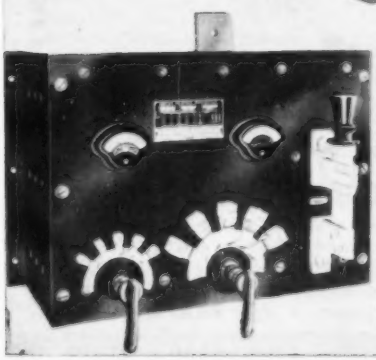
To load—stretch rack on racking board. Insert pieces. Release rack to lock pieces under tension.

To unload—Hold rack over container and stretch. Made of ⅛" phosphor bronze. Holds parts to ¼" diameter.

Racking Board only $4.50

Rack only $8.50 Holds 50 pieces

Close Regulating Tank Rheostats



Commutating type. Regulate current in one ampere steps. Any amperage desired from one to maximum rating of rheostats. Sizes from 5 to 10,000 amperes and larger.

Accurate control means accurate plating.

All prices F.O.B. Chicago, Ill.

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EVERYTHING FOR PLATING PLANTS

◀ INDICATE B 1202.

AES NEWS

Francis R. Murphy of Fort Lee, N. J. is PLATING MAGAZINE'S production manager. He recently succeeded Richard E. Huntley who has become associated with the Westbrook Printing Company in Philadelphia.

A production manager for some four years of the Howes Publishing Company of New York prior to his appointment by PLATING, Murphy, for six years before that, was a production manager of the McGraw-Hill Publishing Co.

Dr. Carr Appointed Plating Courses Chairman

▶▶▶Dr. Dodd Carr, Bart Manufacturing Corporation, Belleville, New Jersey, Librarian of the Newark Branch, was recently named Chairman of the AES's new Committee on Electroplating Courses by Dr. Samuel Heiman, AES President. The Committee when implemented and made operative will foster and encourage the growth of such classes. Among other functions it may act as a clearing house for an exchange of material of interest to instructors of these courses.

As the Committee's progress gains momentum it is expected to be helpful not only in the foregoing but also in marshaling information on current electroplating classes for publication, as usual, in the August issue of PLATING.

Committee Appraising Awards System to Report

▶▶▶Active and functioning is the Committee appointed some months ago by the Editorial Board Chairman, John P. Nichols, at that Board's request, to appraise the Society's current Paper Awards System's effectiveness and, by January 1, 1957, submit a report covering its findings and recommendations for review first by the Editorial Board then reference to the Executive Board for consideration and action.

Past President Arthur W. Logozzo of the Nutmeg Chrome Corporation, West Hartford, Conn., heads the Committee which also includes S. Lewis Doughty, Lea Mfg. Co., Southington, Conn. and Dr. Russel E. Harr, Western Electric Co., Chicago, Illinois.

Wysong Appointed to Explore AES Scope

▶▶▶In order to explore the desirability for broadening the base of the AES along the direction of organic finishing and phosphate coating, Dr. Samuel Heiman recently appointed AES 3rd Vice President Ralph D. Wysong of the Studebaker-Packard Corporation, South Bend, Indiana, to spearhead active appraisal of this subject, perhaps with a Committee to be formed under his leadership.

Among other possible duties, the Committee will assist in the effort of the Editorial Board and others to increase the flow of organic finishing papers to PLATING.

The direction of its exploration may include both the scope of the organic finishing now done by AES members and the specific interests of the Society's members in this field.

Developments and fuller details on this entire project will be reported by PLATING when available.

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BRAND New SCHAFFNER C-100

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recommended for
MIRROR FINISH ON NICKEL AND COPPER
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Request for SAMPLES on your LETTERHEAD will be honored immediately
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COPPER FLUOBORATE

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- ☐ TC-36431 Plating of Baby Shoes
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- ☐ TG-36431 Plating of Printed Circuits
- ☐ RA-36431 Copper Plating from Fluoborate Solutions
- ☐ RB-36431 Copper Fluoborate Plating Experiences

FERROUS FLUOBORATE

- ☐ TA-37641 Iron Plating of Stereotypes
- ☐ RA-37641 Iron Plating Curved Stereotypes from a Fluoborate Bath

FLUOBORIC ACID

- ☐ TA-30691 Applications in Metal Finishing

INDIUM FLUOBORATE

- ☐ TA-37991 Indium Plating from Fluoborate Solutions

LEAD FLUOBORATE

- ☐ TA-38351 Lead Plating from the Fluoborate Bath
- ☐ TB-38351* Lead-Tin Alloy Plating from the Fluoborate Bath
- ☐ TC-38351* Lead-Tin Alloy Plating in Electrotyping and Other
- ☐ RA-38351* Metal Coatings Improve Solder Flow on Steel and Brass
- ☐ RB-38351* Solderability of Lead-Tin Alloy Plating

NICKEL FLUOBORATE

- ☐ TA-40221 Barrel Plating
- ☐ TB-40221 Plating Stereotypes
- ☐ TC-40221 Plating Upon Aluminum
- ☐ RA-40221 Barrel Plating with Nickel Fluoborate
- ☐ RB-40221 High Speed Nickel Plating of Curved Stereotypes
- ☐ RC-40221 Nickel Plating from Fluoborate Solution

TIN FLUOBORATE*

- ☐ TA-43441 Tin Plating from the Fluoborate Bath
- ☐ TB-43441 Plating of Electrotype Shells
- ☐ TC-43441 Electrotinning of Copper Wire

*Lead-Tin Alloy listed under Lead Fluoborate

BAKER & ADAMSON *Fine Chemicals*
GENERAL CHEMICAL DIVISION, ALLIED CHEMICAL & DYE CORPORATION
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AES NEWS

Vancouver Elects Officers

▶▶▶The AES's Vancouver Branch, currently operating under a Temporary Charter, has elected the following officers to serve to April 1, 1957:

President—William J. Marquardt
1st Vice President—Gordon E. Patterson
2nd Vice President—Harold Dow
Secretary—Jim Lee
Treasurer—S. R. Price
Directors—Jack Stoneberg, Neil Holman and Sid Storer.

The Vancouver Branch was granted Temporary Charter at the September Meeting of the Executive Board.

New Milwaukee Division

▶▶▶At the October 5, 1956 regular meeting of Milwaukee Branch, AES, Leslie Dively urged that the Branch pioneer an active organic finishing division with its own educational program.

The proposal met with approval and the organic division will have its first meeting on December 7. The following amendment to the Branch Bylaws was proposed:

Article III
Section 8

The membership of the Branch shall be separated into Divisions for the purpose of furthering the specific interests of the members. A member may enroll in as many Divisions as he chooses. Each Division may enact supplementary Bylaws to fit its needs, but in no instance may the Bylaws of a Division contradict or oppose in any manner the Bylaws of the Branch or the Constitution and Bylaws, as amended, of the American Electroplaters' Society.

INTERIM MEETING

Penn-Sheraton, Pittsburgh, Pa.

FRIDAY, JANUARY 11:
10 A.M.—Executive Board Meeting, Parkview Room.
6:30 P.M.—Pittsburgh Branch Dinner, Gateway Plaza.
8 P.M.—Pittsburgh Branch Meeting, Gateway Plaza.

SATURDAY, JANUARY 12:
10 A.M.—Interim Meeting, Pittsburgh Room.
12:30 P.M.—Interim Meeting Luncheon.
1:30 P.M.—Interim Meeting.
5 P.M.—Cocktail Party, Pittsburgh Room.

SUNDAY, JANUARY 13:
10 A.M.—Executive Board Meeting, Grant Room.

BOOKS Cont'd

A Study of Magnesium Fire Extinguishing Agents (PB 121375) by L. M. Greenstein and S.I. Richman. 149 pages; $3.75

Chlorobromomethane combined with a 50 per cent solution of the liquids diisodecyl phthalate or ethanol proved the most effective agents tested for the Air Force for extinguishing magnesium fires.

Magnesium fires are difficult to extinguish due to the great reactivity of their metal with common fire extinguishers. Di-isodecyl phthalate and ethanol have high heat absorbing capacity, phthalate because a great deal of heat is required to bring it up to its boiling point, and ethanol because of its high heat of vaporization.

Chlorobromomethane alone is not a satisfactory extinguishing agent, but reduces the intensity of the secondary fire and inhibits combustion by forming a protective film on the metal. Chlorobromomethane-ethanol combined with boron trifluoride, boron trichloride, magnesium bromide, or calcium bromide increases its efficiency as an agent.

The report may be obtained from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.

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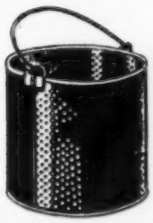

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AES Membership Report

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British Columbia: K. M. Bain, H. Bates, W. N. Holman, J. H. Lee, G. D. Lissner, S. R. Lucas, N. McLeod, G. E. Patterson, S. R. Price, F. Robinson, H. Schenke, J. G. Smith, J. R. K. Stoneberg
Chicago: J. S. Brown, J. K. Harlow, S. John
Cincinnati: W. E. Grotohaus, R. H. Osborn, R. D. Snodgrass
Cleveland: E. J. Butler, P. S. Mancini, A. Rollyson, E. G. Wasilko
Dallas-Ft. Worth: W. C. Coonrod
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Grand Rapids: C. H. Koning, B. Kumko, F. Montague, Jr., G. J. Stamas, E. J. Strosh
Hartford: J. MacDermid, A. R. Roy, F. Tomasinas
Indianapolis: R. K. Niederjohn
Los Angeles: R. H. Andrew, J. P. Bowers, G. S. DuFour, J. D. Kelly, P. E. McQuaid, R. A. Mintz
Louisville: J. S. Gibson, Sr., D. L. Grover, C. C. Whitt
Melbourne: T. P. Williams
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Montreal: L. Daigneault, A. Drewski, D. Semeniw, S. C. Spear
Newark: T. E. Furia, J. J. Keating, R. V. Morrison
New York: R. A. Ayala, T. Delgindice, D. France, P. Frisiana, J. S. Golasheskey, M. M. Goldwasser, R. G. Poole, I. M. Robbins, L. H. Wilson, Jr., J. R. Young
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New York: R. G. Bikales, S. Gewertz, J. Krabel, S. Ratoff, A. Schiavo
Philadelphia: J. I. Deitch, W. G. Hyndshaw, P. Persemperi, A. D. Tentilucci, V. L. La Trechiano
St. Louis: P. W. Babby
Syracuse: C. Hopkins, E. P. Swartz, W. Williams
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Capitol District: L. Brightman to Bridgeport
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Newark: E. Archer from Allentown-Reading, E. C. Rinker from New York
New York: H. C. Haines from Waterbury, C. Oates to Syracuse, E. C. Rinker to Newark
Philadelphia: D. H. Marsh from Cleveland
Pittsburgh: F. Dixon to St. Joseph Valley
St. Joseph Valley: F. Dixon from Pittsburgh
Waterbury: E. B. Washburn from Pittsburgh
Member at-Large: T. A. Todaro to Buffalo

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Cleveland: J. C. Schaefer, A. E. Seeley
New York: R. Pellmar
Philadelphia: E. T. Homan
Seattle-Puget Sound: K. W. Smith

SUSPENSIONS

Allentown-Reading: M. Frey, J. E. McKeone, R. F. Muracca, L. C. Peterson, A. Sciarra, F. E. Snyder, J. F. Szymanski
Central Michigan: L. Bamm, F. Mattson
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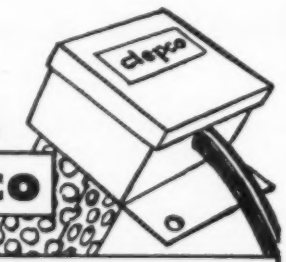

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Syracuse: F. C. Schneider

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Boston: A. Mintie
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As considerable time is required to process a change of address, you are urged to advise the PLATING Circulation Department as soon as you know your new address, preferably three weeks in advance of moving.

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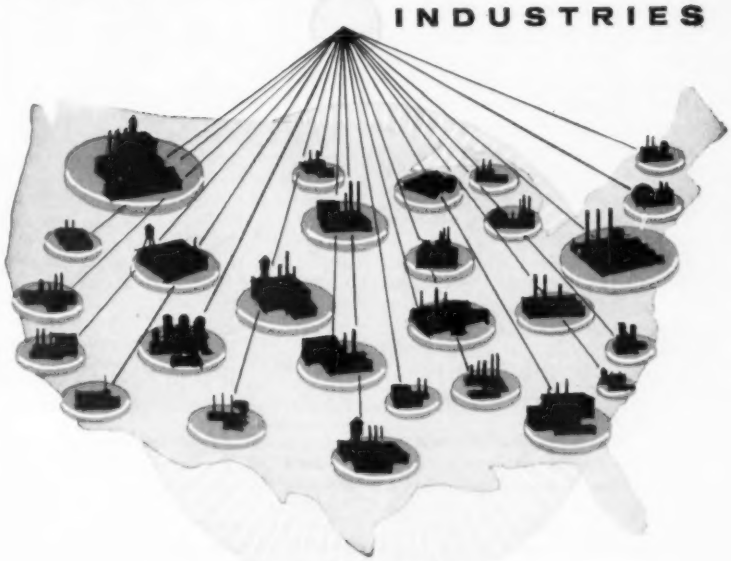

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HOST: AES
PITTSBURGH BRANCH

INTERIM MEETING REPORTER

HOTEL PENN-SHERATON
PITTSBURGH, PA.
JANUARY 12, 1957

Delegates/Alternates Invited To Pittsburgh Branch Meeting

Upon accepting the Executive Board's invitation to host the Interim Meeting of the Supreme Society that will be held in Pittsburgh, Saturday, January 12, 1957, the Pittsburgh Branch also promptly altered its regular meeting date so that by holding it the evening preceding the Interim Meeting, visiting Delegates and members of the Executive Board could be present.

Currently scheduled to be held at Gateway Plaza, Pittsburgh, Friday evening, January 11, the Branch meeting will follow a Branch dinner, starting at 6:30 p.m., which will be open to all National Officers and Delegates. It is expected that the Branch Meeting itself will commence at about 8 p.m.

Serving as host to national affairs is no novelty to the Pittsburgh Branch. Not only was this Branch host of the Society's Annual Convention in 1945 but the Branch was also Host Branch of the 1946 National Convention. In the entire long historical span of the AES, it is the only Branch to have been thus honored twice in succession.

The nation's twelfth largest city—a bustling, accessible industrial community—offers much to see and do. Delegates and Alternates should find Pittsburgh an interesting Interim Meeting site indeed.

December 15 is Deadline For Hotel Reservations

Delegates and/or Alternates planning to attend the Interim Meeting of the Supreme Society at the Penn Sheraton Hotel, Pittsburgh, Pa., on Saturday, January 12 and desiring room reservations are urged to communicate with R. J. Goldbach, 531 Overbrook Boulevard, Pittsburgh, promptly. Because hotels in that city are hard pressed to accommodate a big convention occurring that week-end, deadline for making reservations through Goldbach is December 15.

Cocktail Party to Add Social Note

Aside from its business side, the coming Interim Meeting will provide opportunity to Delegates and/or Alternates for reunion with old friends—always a feature of AES assemblies. One such occasion will be the cocktail party that will immediately follow Saturday's meeting. Joint hosts will be the Executive Board and National Headquarters. Another will be the Branch meeting to be held on Friday evening, January 11 to which all Delegates and Alternates have been cordially invited. The Interim Meeting luncheon will be another popular social event.

RECORD NUMBER OF DELEGATES EXPECTED AT INTERIM MEETING

By decision of the Executive Board of the American Electroplaters' Society (AES) at its September 1956 meeting, Dr. Samuel Heiman, president, has called an Interim Meeting of the Society's governing council, its Supreme Society, to be held at the Penn Sheraton Hotel, in Pittsburgh, Pa., Saturday, January 12, 1957. The AES's Pittsburgh Branch was named Host Branch, and promptly accepted the assignment. Purpose of this Interim Meeting is to hear reports, exchange ideas, discuss problems and chart course in a more leisurely manner than is possible in the crowded Agenda of the Society's annual business meeting at Convention.

Composed of three Delegates from each of the AES's 55 current Branches here, in Canada and in Australia, the Supreme Society is the AES's final governing body. The coming meeting will be its fourth Interim Meeting. Such a winter assembly was first conceived and held in 1951 when the Society convened in Philadelphia with then-president Cleveland F. Nixon in the chair. The second such meeting occurred in Columbus, Ohio, in 1953—the third, in Toronto in 1954. None was held last year.

The tentative Agenda, prepared by Dr. Heiman and disseminated among all Delegates and Alternates plus Branch presidents and secretaries with his Notice of Meeting, calls for a full-day's review by the Supreme Society of practically every conceivable subject of likely interest to it. Substantial benefit is expected to result from the meeting's discussion. The Executive Board hopes for the fullest possible attendance of Delegates and/or Alternates. In 1954, at Toronto, 21 Branches were represented.

The Fourth Interim Meeting will commence at ten o'clock in the Pittsburgh Room of the Penn Sheraton. It will recess for luncheon—then reconvene to adjournment. Immediately following the meeting, the Executive Board and National Headquarters will be hosts to Delegates and Alternates at a cocktail party.

The Executive Board itself will meet in a full-day's session at the same hotel on Friday, January 11. It will continue its meeting at the same place on Sunday.

So as to enable Society Officers, Delegates and Alternates to attend, the Pittsburgh Branch, at the suggestion of the Executive Board, changed its regular meeting date to Friday evening, January 11. Starting with dinner at 6:30 that evening at the Gateway Plaza, the Branch hopes that every Society Officer, Delegate or Alternate will plan to attend. Special plans are being made for a particularly interesting and enjoyable assembly.

Upon accepting the Executive Board's invitation to serve as Host Branch of this Interim Meeting, the Pittsburgh Branch promptly named J. P. Coros of the Standard Steel Spring Division, Rockwell Spring and Axle Company of Coraopolis, Pa., as General Chairman. Coros and his associates are handling all meeting arrangements. As usual, Convention Reporter will be Mrs. Florence Marquardt of Milwaukee, Wisconsin.

In submitting his tentative agenda with Notice of Meeting, President Heiman sought suggestions for additions and modifications from all Delegates. The tentative agenda is presented elsewhere on this page. The final agenda will be published in the January issue.

President Heiman will make the meeting's opening remarks and preside at the assembly. Reports will be heard from all officers, including Francis T. Eddy, first vice president; Herberth E. Head, second vice president; Ralph D. Wysong, third vice president and Clyde Kelly, past president. John P. Nichols, executive secretary, will make his interim report. Chairmen of major AES standing and special committees will also provide reports.

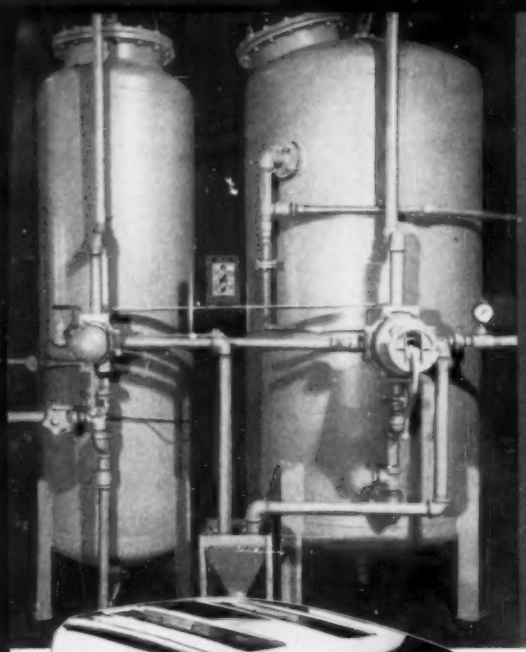
TENTATIVE AGENDA

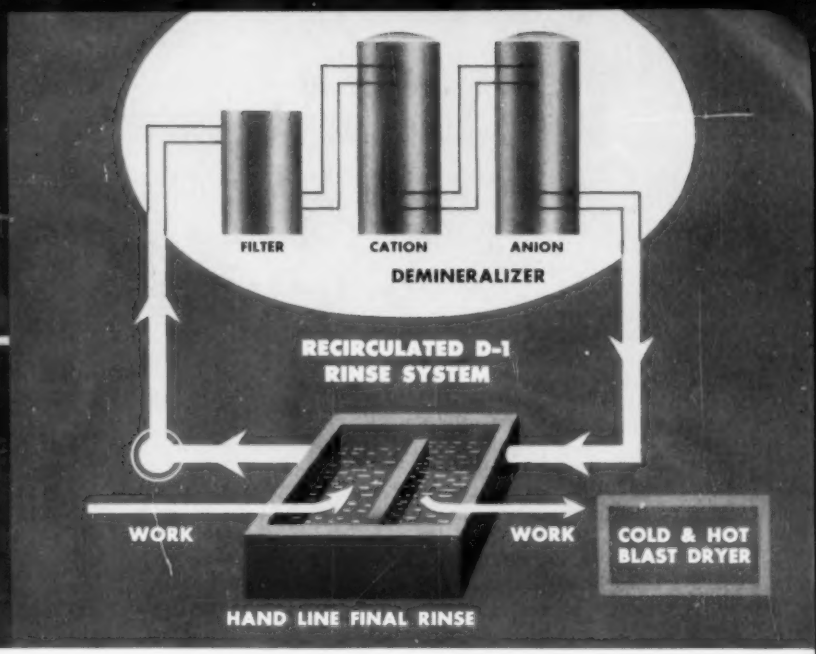
Interim Meeting, AES Supreme Society

Penn-Sheraton Hotel, Pittsburgh

January 12, 1957

- Roll Call
- Reports of Executive Board Members
  - Opening Remarks
  - Financial
  - Membership
  - Organic Finishing Group
- Report of Executive Secretary
- Society Publications
  - PLATING
    - Editorial Board
    - Editor
    - Advertising Manager
    - Name of Magazine
  - Technical Proceedings
- Society Committees
  - Educational
  - Research
  - Publications
  - Process Control Handbook
  - Structure of the Society
  - Law
  - Constitution & By-Laws Revision
  - Research Committee
  - Public Relations
  - Broadening the Base of the Society's Operation
  - Branch Officers' Manual
  - Plating Courses
- Inter-Society Committees
- Conventions and Expositions
  - Montreal, 1957
  - Other Conventions
  - Split Registrations
- Discussion From the Floor of any New Business
- Candidates for Third Vice-President





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All AES Roads Lead to Montreal

PLANS FOR THE AES's 44th Annual Convention to be held at the famed Mount Royal Hotel in Montreal, Canada, June 16–20, 1957, are fast gaining momentum according to G. Ross Davidson, the Convention's general chairman.

With an enthused Montreal Branch serving as host for the Convention's first return to that great Canadian metropolis since the successful Montreal meeting held there over a quarter-century ago, advance preparations seem to herald a noteworthy odyssey across our Northern border by some 1500 AES members and their families in June.

Members, first off, will be impressed by the educational program in the making under the leadership of Educational Chairman Philip M. Coady and his associate, Dr. J. Kane, co-chairman. Featuring five single instead of five dual sessions as in Washington in 1956, the 1957 Convention's educational program is being pegged for versatility as well as high quality. The busy Montrealers are expecting to provide the Editorial Board with an impressive selection of technical papers for consideration when that Board convenes in Montreal, January 18, to appraise abstracts.

The social and extra-curricular phases of any Convention are vital elements in the benefits accruing to members. And the array of these being marshaled by the Montreal Committee against the setting of the elegant, 1100-room Sheraton-Mount Royal Hotel in picturesque Montreal are enticing convention morsels indeed.

Situated at the apex of the mighty St. Lawrence River—a community renowned for its shrines and its Norman architecture—peopled by a busy, progressive yet merry citizenry almost all of whom are as fluent in French as in the Queen's English—Montreal city on Montreal island is a delight to the traveler. Its French and Canadian cuisine is world-famed—and some of the famous restaurants serving it are housed in quaint buildings dating from Montreal's hardy pioneer days.

Not only is Montreal vaunted as the best equipped winter sports city on the North American Continent, with an actual steep mountain rising in its very heart, but it is also reputed as having more golf courses within its confines than any comparable area in North America.

Against this magnetic background, AES members and their families will variously have opportunity next June to view the Lookout atop Mount Royal or to enjoy a caleche ride.

They can, if so minded, visit St. Joseph Oratory, Notre Dame de Bonsecours, Notre Dame Church or St. James Cathedral.

They may, if so bent, visit the Chateau de Ramezay, the Old Fort, St. Helen's Island, the Wax Museum or the Botanical Gardens.

They may pay a call to the Indian Reservation at Caughnawagha—or glory in the vivid wonders of the Laurentian Mountains.

The Host Branch

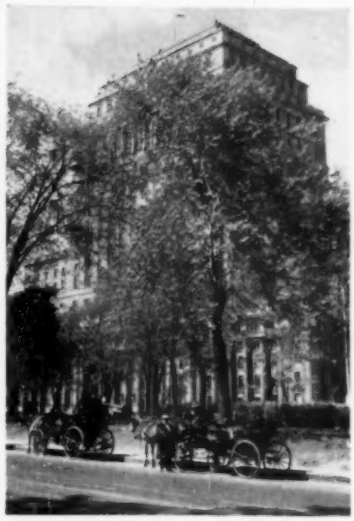
The Convention's Host Branch itself is one of the Society's most dynamic and most dedicated affiliates, consequently assuring a warm welcome to Montreal's Convention visitors and a pleasant, comfortable and well-planned Convention stay.

Created in 1920, practically in the nadir of that post-World War I's depression, the Montreal Branch, like every other veteran AES Branch, has successfully weathered bad times and flourished in good eras.

By 1925, it had sufficient stature to garner the AES's first convention outside Uncle Sam's frontiers. Over three decades later, it had the still greater strength and appeal needed to vie for and bring the Society's convention back to Montreal.

The late John H. Feeley, founding father of Montreal's Branch, will miss this one—but his enduring spirit is inspiring Montrealers to fashion the type of convention, in Montreal locale, with Montreal flair, that no AES member, American or Canadian, can afford to miss.

Now, therefore, is the time to start planning to journey northwards next June because all AES roads, then, will lead to the city founded by Paul de Chomedy, Sieur of Maisonneuve, over three centuries ago. They will lead beckoningly to today's MONTREAL, site of the Society's 44th ANNUAL CONVENTION.



Quaint caleches, used by sightseers, drawn up in Dominion Square, Montreal. Sun Life Building in background.

Meet Montreal
Growing Industrial Titan

Home of the stock exchange on famed St. James Street—a municipality throbbing with inland navigation by canal systems and waterways shimmering miles and miles into the heart of the continent—picturesque Montreal is not only a gay city—it is seriously and increasingly an industrial titan.

A global exporter of Canadian products besides being an abundant provider for domestic consumption, Montreal, today, houses over 4500 industries with an annual output of some $3 billions. AES Delegates and Alternates will be impressed indeed with its hydro-electric power; its mammoth oil refinery centres; its modern, hard-hitting manufacturies which range from locomotive, shipbuilding, aircraft and engine fabrication to softer lines such as chemicals, boots and shoes, clothing, even cigars and cigarettes.

Education and pleasure will verily team next June to make the AES Delegates' and Alternates' Montreal convention stay a memorable investment—*like a good convention should.*

The Montreal Convention's indefatigable triumvirate. Left to right, G. Ross Davidson, Convention Chairman; Philip M. Coady, Educational Sessions Chairman, and President, Montreal Branch; and Dr. J. Kane, Co-Chairman, Educational Sessions

a new superior copper process

ISO-BRITE COPPER

You needed it! Wagner developed it! You'll praise it!

NEW . . . BETTER . . . BEST . . ! "Words, words, just another claim," you may think, for rare indeed is anything new really superior in your metal finishing world. But we at Wagner Brothers have spent years on the copper problem and the *production* performance of *our* new ISO-BRITE Process has encouraged us to go all out. So we're making *big claims*. But these claims have already been *proven* by the most critical of production platers—and we're anxious to prove them to you. We offer you . . .

1. Ease of control—and our proof is the voluntary praise of dozens of qualified men in automotive, hardware, plumbing and other fields.
2. High anode efficiency—virtually eliminating costly copper cyanide additions. Just replace drag-out.
3. Much heavier plate—one case previously averaging .0004" increased by ISO-BRITE COPPER to .0008" at the same check points, by eliminating sacrificial wave forms.
4. Freedom from roughness—electrolyte has no inherent tendency or characteristic to promote rough deposit. Our technical staff can advise you on contributing physical or mechanical causes.
5. Fine grained, dense, ductile deposit—fully bright coming out of the bath, easily buffed if your job is steel.
6. Wide operating range—up to 60 amperes per sq. ft. in actual production. Temperature range from 135° to 165°.
7. High tolerance of organic contamination—much less maintenance. Excellent for die castings.

Of course, Wagner ISO-BRITE Copper costs no more than competitive copper solutions—yet it saves money in every way while producing vastly higher quality. We can't hope to have you accept all we claim here; we offer the proof of the pudding. Wire, phone or write for Bulletin 70.2 and the name of the Wagner man in your area.

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BRIDGEPORT

Olde Tymer's Nite Continued

The regular business meeting and educational session of the Bridgeport Branch AES was held in the main ballroom of the Hotel Barnum on Friday, October 12, 1956. President **Bonazzo** presided with 39 members and guests present.

President Bonazzo appointed **R. Barrett, W. Lindsay, M. Tamas, F. Tatum** and **R. Parker** to serve the interests of the Bridgeport branch for N. E. Regional.

Al Ferguson, chairman of the Christmas dinner-dance, reported that most of the details had been arranged. The date was set for December 8 at the Hotel Barnum.

The Executive Committee reported they had decided to continue with Olde Tymer's Nite.

Ray O'Connor and **Fred Lancaster,** co-chairmen of Olde Tymer's Nite, will carry out their responsibilities for this affair. President Bonazzo appointed **Carl Sievert** and **Emil Bergen** to assist them. Richard Barrett of Barrett Chemical Co. offered to underwrite this undertaking.

Lack of cooperation from newspapers was reported. The president appointed **W. Hyatt** chairman of the Publicity Committee in order to permit the librarian to have more time to fulfill his obligations.

The Branch expects to be able to present the incumbent president with a suitably inscribed gavel donated by Casco Products Corp. in honor of **Bill Ehrencrona. George Eckholm** expressed a desire to be the donor if Casco does not donate the gavel.

George Eckholm made a motion to present each new member with a membership pin and certificate. **R. Arnow,** recently inducted member, was the first recipient.

Art Kohler, technical director of Frederick Gumm Chemical Co., gave an interesting talk on Barrel Finishing. He showed many samples of various metals finished by this method and outlined the many pitfalls inherent in the method and how to avoid them. A short question and answer period brought the meeting to a close.

Bob Parker
Secretary-Treasurer

CENTRAL MICHIGAN

Paper Delivered on Plating Room Costs

The Central Michigan Branch of the AES held its first dinner-program meeting, after the summer recess, on October 9, at the Porter Hotel in Lansing.

About 35 members and guests were in attendance, with President **G. S. Woodruff** conducting the business meeting, which covered an excellent financial report on the last month's golf stag, the unveiling of the Branch's new slide projector, and a discussion on membership. The feature speaker of the evening was **Frank K. Savage,** of the Savage-Rowe Plating Company, Inc., who gave an excellent paper on "Plating Room Cost." The evening was concluded with a social hour and refreshments.

Earl D. Creese
Publicity Secretary

CHICAGO

Double Program Includes Dr. Lowenheim

The October business and technical session of the Chicago Branch was held October 12, 1956 at the Western Society of Engineers, 804 East Randolph Street.

The technical session was rather a double-header program. During the first part a former member of the Chicago Branch Board of Managers and a long time member, **Harold R. Bulenberg,** from the Material Inspection Laboratory of Sears Roebuck and Company, gave an interesting discussion of the problems involved in controlling large quantities of plated consumer goods. He told us of inspection methods and specification systems used at Sears.

The main speaker of the evening, **Dr. Frederick Lowenheim,** of Metal and Thermit Corporation, is well known for his work in the field of tin and tin alloys and regularly is called upon by the Chicago Branch because of his down to earth presentation of usable information. Dr. Lowenheim gave a very interesting discussion on plating tin-bronze, tin-zinc, and tin-nickel alloys which covered make-up of the plating baths, operation, and control as well as the corrosion resistance of the alloys. The result of test panels which were exposed at Bayonne, New Jersey, Pittsburgh, and in Florida were discussed.

J. C. Corre
Publicity Chairman

CINCINNATI

Latest Plating Preparation

The October meeting was called to order by President **Roof** with 23 members and 8 guests present. Three applications for membership were approved.

Dr. R. O. McDuffie explained the details of the Bond Issue for the University of Cincinnati.

Earl Gothier of the Minnesota Mining and Manufacturing Company presented a discussion of the latest development in the preparation of metals for plating, namely, the P-G Wheel. Gothier pointed out that the P-G Wheels provide the link between abrasive belts and buffs. A movie was presented which pointed out many practical applications of abrasive belts. A question and answer period completed the program.

The social hour was sponsored by the Minnesota Mining and Manufacturing Company.

David L. Kaplan
Secretary

COLUMBUS

Korbelak Presents Paper

The regular monthly meeting of the Columbus branch AES was held at Battelle Memorial Institute on Friday, October 5, 1956.

The business meeting was called to order by President **Bill Shriver.**

Tri-State committee member, **Doug Gordon,** told about the annual meeting to be held at French Lick Springs, Indiana on March 30, 1957. **Bill Neill** requested that Doug Gordon distribute copies of the Tri-State Region bylaws.

Librarian **George Skelly** introduced the speaker of the evening, **Al Korbelak** of Sel-Rex Precious Metals Inc., Belleville, N. J., whose subject was "Industrial Applications for Precious Metals Coatings." Korbelak gave an interesting talk on gold, silver and rhodium plating.

Halvor Christianson
Secretary

DAYTON

Resume 5 Minute Talks by Members

The regular meeting for October was held at Pappy's Kitchen Klub. Twenty-four members and friends were present.

Two new members were accepted.

The Branch Bylaws were amended to provide that Delegates and Alternates may be elected at any regular meeting prior to the April meeting. Elections previously had been in April.

Librarian **Byron Bowman** stated that the 5 minute talks by Branch members in addition to the regular speaker will again be resumed.

The speaker for the evening, **W. J. Pierce** of the Research Dept., Harshaw Chemical Co., gave an informative paper on "Microscopic Techniques in Plating."

Refreshments after the meeting were through the courtesy of Harshaw Chemical Co., and their representative in this area, **L. J. Howald** of Cincinnati.

R. M. Clinchens
Secretary

GRAND RAPIDS

Annual Ladies' Night

The Grand Rapids Branch AES held its annual Ladies' Night at the Plantation Ball Room Thursday, October 11, 1956. More than 180 members and their wives attended this party, where the wives are the guests of the branch. **John Dykstra,** president, greeted the wives.

After the Smorgasbord dinner, **Carl**

New "PG" Wheel hikes production 40%!

1. PRODUCTION PROBLEM: The Albert Plating Works of Brooklyn, N.Y., bends, finishes and plates cold-rolled steel tubing chair backs. The finishing operation—removing stretch marks and blending the steel surface prior to plating—was formerly a two-step job: grinding with a Grit #180 set-up wheel, then surfacing with a grease-coated stitched buff wheel. Production was slow and costs high because of constant wheel dressing.

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BRANCH NEWS

Green and his committee distributed the door prizes. As usual the prizes were very nice and each lady present received something. The prizes were donated by the suppliers in the Grand Rapids area.

The remainder of the night was devoted to dancing and refreshments. All in all, everyone had a wonderful time and the entire committee of Carl, John, **Steve Cowdery, Jack Hanney, Perry Burnham,** and **Morrie Tardiff** was praised.

Grand Rapids Branch has scheduled the following program:

December 14, 1956—"Atomic Research from the Metallurgist's Viewpoint" by David Lillie, General Electric Company
January 11, 1957—"Our Jet Program" by Eli Bradley, Pratt & Whitney Corporation
February 16, 1957—Annual Educational Session and Dinner Dance. Pantlind Hotel
March 8, 1957—"How Parliamentary Law Can Help Your Branch" by George W. Cavanaugh, General Electric Company. Nomination and Election of officers for 1957-1958 Season
April 12, 1957—Installation of Officers for 1957-1958 season. "Crack Free Chromium" by E. J. Seyb, United Chromium Division, Metal & Thermit Company
May 10, 1957—Annual Stag Party

Paul A. Waalkes
Publicity Chairman

HARTFORD

Strowe Talks on Trouble Shooting

The regular Branch meeting was held at the Bond Hotel on October 15, 1956 with 59 members and guests present.

The guest speaker for the evening was **Henry Strowe** of The True Brite Chemical Products Co., whose subject was "Trouble Shooting in Nickel and Copper Solutions."

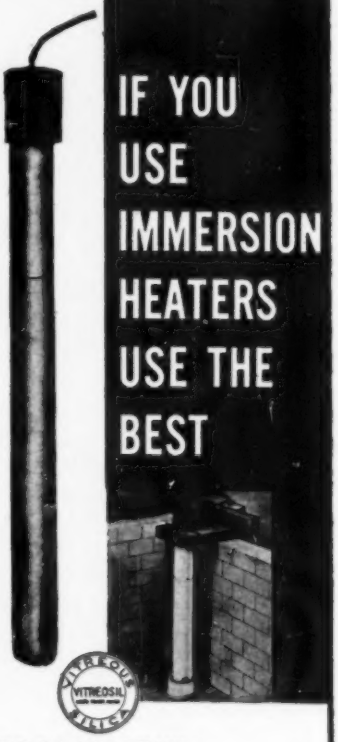
Strowe pointed out that you must first locate the source of the trouble, secondly prove that it is the source of the trouble and then work toward its final elimination.

As suggestions for trouble shooting, Strowe recommended double checking the chemical analysis of the baths, checking the cleaner strengths, temperature controls on the tanks, make sure enough current is passing through the electro-cleaner, check current leakage. Poor rinsing may be due to changes in water temperature in the summer and winter (in the winter time the rinse may have to be heated or a double rinse used), record on paper all changes in plating cycles so that it can be referred to some time later, check variations in tank temperatures, use a Hull cell for checking for impurities in the bath and spotting and tarnishing may be due to poor rinsing or drying.

Dick Mullaney was the technical chairman for the evening.

In the absence of **Armand Faucher, Arnold Johnson** reported on new developments.

Stanley Platoz
Secretary



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BRIGHT NICKEL MINIMIZES PROBLEMS

To plants thinking of ways to minimize bright nickel plating problems, the Unichrome Bright Nickel process has much to recommend it. The deposits prove unusually receptive for chromium plate; they resist cracking, give excellent corrosion protection to the base metal.

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BRANCH NEWS

INDIANAPOLIS

Band Entertains Members and Guests

On October 3, 1956, 49 Branch members and guests met at Arvin's Central Park Cafeteria in Columbus. **Tom Evans** introduced the head of the music department of Columbus High School, who presented the Blue Notes dance band of 22 pupils in several numbers, as well as vocal and instrumental solos.

Following the music, **T. K. Smith** gave the three philosophies of life as portrayed in the story of the Good Samaritan.

Each member made the customary introduction. Dr. Max sent word that there is room for a few more in the electroplating class since the $40 fee has been established.

Nominations of delegates and alternates for the national meeting was postponed to next month, on motion by **Ed Bruck.**

Our president, **Marshal Whitehurst,** announced that members would receive a yellow card from National Headquarters requesting classification information which should be promptly filled in and returned.

An application for membership was submitted.

Ezra Blount, editor of Product Finishing, announced that the Cincinnati Branch has ratified the bylaws of the Tri-State Organization.

Paul Freeman
Secretary

LOS ANGELES

Ostrow Talks on Plating

The October meeting was held on Wednesday night, October 10, at Rodger Young Auditorium in Los Angeles. The meeting, attended by a record membership and guest figure of 130, was called to order by President **Stoner.**

First Vice President **George Magurean,** as membership chairman, introduced six applicants for membership, which were formally initiated by the president.

Kenneth C. Johnson gave a report on sustaining membership status.

Emmett Babcock, librarian, gave an elaborated report on the National AES June Convention technical session papers.

Harvey Hunt, chairman for the annual dinner-dance and educational session, gave a report on preliminary plans for the affair which will be held at the Ambassador Hotel, Los Angeles, in 1957.

President Stoner announced our December meeting as a Ladies' Night to be held on December 14.

The guest speaker for the evening, **Barnet D. Ostrow,** technical director of Lea-Ronal, Inc., Jamaica, N. Y., chose as his topic "The Plating of Precious Metals," which was supplemented by slides and followed by a very active question-and-answer period.

Frank Virgil
Secretary

LOUISVILLE

The regular monthly meeting of the Louisville Branch AES was held Thursday, September 20, 1956, at Kapfhammers Party House, 1506 South Shelby Street, Louisville. President **K. C. Reifsteck** opened the business and open meeting, attended by twenty-four members and guests.

The Special Committee reported the Tri-State Regional Meeting will be held at French Lick Springs, Indiana, March 30, 1957.

President Reifsteck turned the meeting over to Technical Sessions Chairman **J. S. Houston** who introduced the speaker, **Mr. McLaughlin** of the Behr Manning Co., Troy, New York. The subject was "Polishing and the Manufacture of Abrasive Belts," which was accompanied by pictures.

Considerable discussion followed and McLaughlin was given a rising vote of thanks.

J. G. Sterling
Secretary-Treasurer

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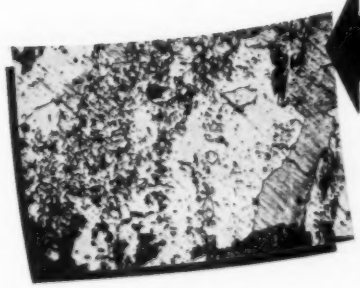

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BRANCH NEWS

MELBOURNE

Australia Entering Mass Production

The president, **Mr. Littauer,** chaired the meeting at which 42 members and friends were present.

The speaker for the evening, **Jim Anderson,** chief metallurgist of General Motors-Holden's Ltd., was introduced by **L. Esmore,** the subject was "Plating to Automobile Standards."

Australia is rapidly moving from the job plating era to the mass production phase. The Holden Car production has reached the 300 per day mark, each car with 30 sq ft of plating. The shortage of nickel raised some interesting points and general economies may be effected in areas not regarded as significant, by the reduction of rejects, minimizing of plating of racks, the use of thicker copper deposits, reduction of excess nickel plating thickness, reduction of dragout loss, and, lastly, care of electroplate by the customer.

Substitutes for nickel plate were discussed including the use of anodized and dyed aluminum.

During the discussion which followed many questions arose from the doubtful validity of the salt-spray test and the adoption of U. S. Standards for Australian conditions.

MISSISSIPPI VALLEY

The Mississippi Valley Branch of the AES held its October 1956 meeting at the Tower Restaurant on the 17th.

The meeting was preceded by a dinner in which 12 members and visitors participated.

The meeting was called to order by our President **Lloyd Gilbert,** who stated that the November meeting will be a business meeting. He asked members to present methods for getting new members, including student memberships and more platers.

Librarian **John Hartman** read a letter from **Francis Eddy** asking for more articles for PLATING magazine. He also announced that our president, Lloyd Gilbert, is being considered as a candidate for 3rd vice president of the National Society. Hartman then introduced the speakers of the evening, who were **Mr. Kerchoff** of the Exolon Corp., and **Mr. Oswald** of Stutz Mfg. Co. Their subjects involved the use of abrasives in the plating industry.

Mr. Kerchoff took us through his company's Ontario and New York plants by way of slides. The Ontario plant, where alumina and silicon carbide are produced was particularly interesting. In this plant bauxite or silica sand and petroleum coke are heated to extreme temperatures in electric furnaces until chemical combination occurs. The melt is then cooled, crushed, and shipped to the New York plant where it is further crushed, sized and packaged. Abrasive wheels and belts are also produced in this latter plant.

Mr. Oswald discussed buffing compounds and related special applications. He cited the trend away from buffing wheels toward belts. A lively question and answer period followed.

A color film, entitled "A Brighter Tomorrow," produced by Bart Messing Co., was shown by our 2nd Vice President, **Bernard Nordblom.** It was a splendid film depicting the strides our industry is making.

Gilbert announced that the film for the November meeting will be "Romance of Industry."

Paul G. Chamberlain
Secretary-Treasurer

MILWAUKEE

Dr. Lowenheim Initiates Educational Season

The 472nd regular meeting was held October 5 at the Ambassador Hotel in Milwaukee. There was an atmosphere of enthusiasm because of the excellent programs scheduled for the 1956–57 season.

Leslie Diveley called attention to the fact that, in addition to being devoted to the science of electroplating, the AES according to definition also includes "The Finishing of Metals and Allied Arts."

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BRANCH NEWS

Consequently, Mr. Diveley presented an amendment to the Branch Bylaws, published on page 66 in this issuein AES News.

After adjournment of the business portion of the meeting, **Dr. Robert Ritzenthaler,** curator at the Milwaukee Public Museum, presented a message and short movie of civic interest. Dr. Ritzenthaler is a brother of **Phil Ritzenthaler,** one of our members who is active locally and nationally in the AES.

Dr. F. A. Lowenheim of Rahway, New Jersey, supervisor of electrochemical research for Metal & Thermit Corporation, was the lead-off speaker for the 1956–57 educational season. Dr. Lowenheim spoke on "Tin Alloy Platings and Their Properties."

The general principles of alloy plating were discussed briefly and it was pointed out that with modern methods of control, alloy plating has become practical. It was demonstrated that most alloy plating solutions used one or more complexing agents for the metal ions involved and that one of the main principles of control was the careful maintenance of the proper concentration of the complexing ion.

This paper was primarily concerned with bronze (tin-copper), tin-nickel and tin-zinc with emphasis on the first two. A short resume was given of the processes used for plating these alloys and of the properties of the deposits which made them attractive in various applications.

It was pointed out that bronze was an improvement over copper as a base for nickel-chromium plating and, in some applications, permitted the use of substandard thicknesses of nickel. Representative samples of bronze plated parts demonstrated that it was attractive as a final finish and could be plated bright, semi-bright or dull, depending on the application.

Tin-nickel appeared at least the equivalent of nickel-chromium in corrosion protection and in many atmospheres seemed superior. A matter of interest was that since tin-nickel uses only one-third nickel, it was in effect a partial substitute for this hard to get metal.

It was indicated that tin-zinc was finding its principal application in the electrical and electronic industries where good corrosion resistance is combined with excellent solderability and retention of solderability on aging.

The remainder of the paper was devoted to detailed presentation of outdoor corrosion data and slides on bronze and tin-nickel.

Interest generated by this paper was demonstrated by a brisk question and answer period and the intense examination of alloy plated parts on display.

S. R. Taterzynski
Secretary-Treasurer

MONTREAL
Gold and Rhodium Plating Presented

The October 1, 1956 meeting was held in the Mount Royal Hotel. As President **P. M. Coady** was not present the chair was occupied by 1st Vice President **J. Serbeniuk.**

Librarian **J. Rennie** was asked to introduce the speaker of the evening, **Frank K. Smith,** president of Tecknic Inc. of Providence, R. I.

Smith gave an excellent talk on gold and rhodium electroplating, backed by a seemingly unlimited store of knowledge of his subject, which enabled him to answer all the questions put to him by the members.

He was thanked on behalf of the branch by **G. R. Davidson** for his much appreciated talk.

Application for four memberships were read and approved.

A brief convention report was given by Chairman G. R. Davidson who also reported that the Ladies' committee is organized and making good progress.

N. Cronin reported on the progress made to date by his dinner-dance committee.

NEW HAVEN
Informative Educational Program Highlight of Meeting

The highly successful October meeting was called to order by the president, **Austin P. Jackson.**

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Ed Busby, chairman of the program committee, reported on the Christmas party to be held December 1 at the Fireside Restaurant, Milford, Conn.

Ed Foley reported there are a few openings for men interested in taking the Plating Course at New Haven College. This course is operated in conjunction with the AES.

Two applications were read by **B. Gaffney** who also reported on the progress of the Regional Committee.

The meeting was turned over to the technical chairman, **Charles Kuster,** who introduced the speakers for the evening, **Leslie Piddington,** Dalic Metachemical Ltd., Toronto, Canada; **Marvin Rubinstein** and **Jesse Lane** of the Marlane Development Co. Inc., New York. These men talked on "Plating for Engineering Purposes Utilizing the Dalic Process."

The talk covered a brief history of brush plating; development of the process, characteristics of the deposit applications, etc. A very interesting demonstration followed the educational talk at which time various metals were plated—samples from the audience were plated, and passed around to be examined.

The talk and demonstration was followed by a very extended and interesting question and answer period.

This program revealed the many applications of the Dalic Process which are limited only by the imagination of the user. Many of these applications such as precision fitting of bearings, all kinds of build-up operations of worn or mismachined components, gold and rhodium plating of electrical contacts, rechroming of worn dies and tools, plating of titanium, molybdenum, germanium and other difficult to plate metals.

The October meeting far exceeded the September meeting in attendance and interest.

Guests were present from many neighboring branches and their presence was gratifying. The door prize was donated by **Ray Doral** of Enthone, Inc.

B. Gaffney
Secretary-Treasurer

NEW YORK

Plating on Molybdenum Heard

The September 28, 1956 meeting was called to order by President **D. Hartshorn Jr.**

Ten candidates were accepted and duly sworn as members of the New York Branch.

A letter received from Mrs. Langdon expresses thanks to all those responsible for achieving the election of **Tom Trombour** to Honorary Membership in the National Society.

Librarian **Joe Rembecki** reports he has completed a list of speakers for the coming year.

The Washington Convention was reported on, with the consensus being that too many papers presented at dual sessions proved too confusing for ultimate appreciation.

George Herrmann reported that committees for the coming banquet have been appointed to provide for the necessary preparations. **Phil Bruno,** on advertising, stated that letters were being sent to prospective sponsors.

Perez McDonald of Mexico City, briefly outlined the growing needs of the plating industry in Mexico. He also stated that an educational group (80 members) formed in Mexico will eventually try to become a branch of the AES. The regular speaker of the night, our own **Isidore Friedman,** head, metal finishing unit Chemical Engineering Section, Curtiss-Wright Corp. supplied us with a procedure for plating on molybdenum. The effect of heating molybdenum in air, and the protection afforded by deposits of chromium, and nickel-chromium composites, were shown by actual demonstration. Friedman's brief paper was followed by a very enthusiastic discussion period, and an announcement that future work involves the application of noble metals deposited in a non-porous condition.

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BRANCH NEWS

President D. Hartshorn Jr. also presided at the October 12 meeting.

Librarian Joe Rembecki introduced the speaker, **Mr. Ivans** of the Hanson-Van Winkle-Munning Co. Ivans' subject was "Low Voltage Electrical Equipment for Plating and Anodizing." In his talk he first explained the functions of numerous parts of a rectifier and then stressed the need for better controls to meet the newest requirements in plating and anodizing.

Anthony P. Briganti
Recording Secretary

NEWARK
Helbig Explains Use of Activated Carbon

The October meeting was held at the Robert Treat Hotel with **Clifford Struyk** presiding. There were 63 in attendance. Eight applications were received and three new members were elected.

William Grigat reported as chairman of the banquet committee that the Christmas Party would be a good one and as chairman of the membership committee that certain membership aids were available from him. **Dodd Carr,** chairman of the Newark Electroplating School Committee reported a new session under way at the Essex County Vocational School with sixteen enrolled.

A. Korbelak presented a resolution directed to the Executive Board of the Society recommending that steps be taken to request an AES stamp be issued by the government in 1959. The resolution passed.

Librarian Carr then introduced the "Timely Topic" speaker **Walter B. Kleiner** who described the manufacture of Spiral-Glas tubing. This tubing is substantially a fiber glass pipe of high bursting strength with an inner lining (poly-vinyl or -ethylene) which renders it extremely corrosion-resistant.

Walter Helbig of Atlas Powder Co., Darco Division, as the principal speaker of the evening, discussed the uses of activated carbon with particular reference to the plating industry. He explained the activity due to the extremely large adsorptive surface available for the removal of organic materials, particularly large molecules not too water-soluble. Activated carbon has been used successfully in all baths except chromium. Intermittent treatment both batch and filter cake and continuous treatment methods were described as well as some of the filtration factors to be considered. He recommended in acid solutions filtration rates below 50 gal/hr and for alkaline solutions 25 gal/hr or under.

D. Gardner Foulke
Secretary

PHILADELPHIA
Annual Education Session and Banquet

The annual educational session was held at the Benjamin Franklin Hotel, Philadelphia, on Saturday, October 20, with an audience of 45. After an introduction of guests by Branch President **Trusdell,** the session chairman, **Dr. A. Kenneth Graham,** introduced the speakers.

Dr. Harold J. Read, Professor of Physical Metallurgy, Pennsylvania State University, was the first speaker, his topic: "Mechanism of Corrosion of Plated Coatings." He stated that his remarks were restricted to the corrosion taking place in neutral salt solutions, such as the water of oceans, rivers, streams and rain, with a pH range of from 5 to 8.

He showed results of experiments proving the corrosion of nickel and copper coupled in neutral salt solutions cannot be predicted from their positions in the electromotive series table. With a large nickel area and a small copper area in free contact with oxygen in the solution, the nickel is anodic to copper and behaves in the usually accepted manner. However,

Annual Banquet of the Philadelphia Branch. Clockwise at the tables, from left foreground. (Top Left) Mr. and Mrs. Robert E. Elliott Jr., Branch B. of M. and Mrs. Edwin F. Ottens, Branch Secretary and Mrs. I. William Marcovitch, Mrs. and Dr. Samuel Heiman, AES President; Mrs. and Mr. James L. Dearnley. (Top Right) Herberth E. Head, AES 2nd Vice President; Mrs. C. H. Sample, J. P. Coros, Pittsburgh Branch; Mrs. H. J. Read, Clarence H. Sample, Mrs. A. K. Graham, Dr. Harold J. Read, Dr. A. Kenneth Graham, Dr. and Mrs. Dodd S. Carr. (Lower Left) Birdseye view of part of the banquet. (Lower Right) Mrs. and Branch 2nd Vice President James E. Cogan Jr., Mr. and Mrs. Clarence E. Heyde, Miss Margaret M. McGlone, Richard D. Kerwin, Program Committee; Mrs. and Mr. James D. Glass, Mrs. and Branch President William H. Trusdell

if the copper should be removed from contact of ready oxygen, it becomes anodic and corrodes before the nickel. Thus, a layer of nickel over copper on steel, with a tiny pit in the nickel, will cause a pit to form in the copper at the base of the pit or hole in the nickel layer.

Slides of photomicrographs of plated bumpers showed this phenomenon and the additional fact that a nickel flash over the steel under the copper protected the steel from corrosion. The top coating of chromium had no influence on the results.

The question and answer period following Dr. Read's formal remarks elicited the following pertinent information: nickel strike, acid copper plate under nickel, once used extensively, eliminates the cyanide waste disposal problem; copper corrosion products through the pores of the nickel are objectionable; the copper layer exhibited corrosion either with or without the nickel flash over the steel; it was not known whether the nickel pores were due to exposure or were formed during plating; the initial pores may be due to local stress.

The second speaker was **Clarence H. Sample,** Electroplating Section, Development and Research Division, International Nickel Co., whose subject was "Double Layer Nickel Coatings—Corrosion Behavior and Protective Value." Mr. Sample based his talk on slides of a three-year exposure test at Curie Beach, N. C., of steel panels plated with (a) nickel; (b) copper and nickel; (c) nickel and nickel. White nickel was used and all coatings were buffed. The test results showed one mil coatings of *c* stood up extremely well, *a* was fair and *b* very poor. The tests also demonstrated that 0.5 mil of nickel over any thickness of buffed copper was unsatisfactory. Salt spray exposure tests of the same finishes after 500 hours showed all to be good with *c* slightly better—additional evidence of the noncorrelation between the salt spray test and actual exposure tests.

A panel of nickel over nickel on steel showed a slight pit in the nickel after 5 years exposure at Curie Beach. The same finish exposed for 5 years in New York City was pitted markedly.

The final speaker was Session Chairman Graham, president of Graham, Crowley and Associates and former AES executive secretary, who spoke on "Experiences in Electroplating Nickel upon Nickel." He stated that nickel on nickel is used as a decorative-protective coating, for refinishing of nickel failures after polishing of the defective areas and protection from chemical corrosion. He placed into the following classifications the treatments used to prepare the surfaces for nickel on nickel: (a) engineering applications—the first coating is sandblasted permitting etching without material alteration of the surface; (b) first coating nickels where passivity is the major factor; (c) surface condition of the first coat—polished, satin finished, etc.; (d) time interval between coatings and the environment of the parts before second nickel coating; (e) surface soil to be removed. He gave as the best preparation cycle from the standpoint of not etching buffed nickel and adhesion the following cycle: cathodic alkaline clean, anodic acid (30 per cent by weight sulfuric acid, 1 min, room temp), cathodic alkaline clean, acid dip (50 per cent by volume hydrochloric acid, 3 min, room temp) and nickel plate. Water rinses were included between solutions.

The banquet, attended by more than 300, was held in the Crystal Ballroom. There were door prizes, a floor show and dancing. Philadelphia Branch appreciates the generous response of the many advertisers in the banquet program.

I. Wm. Marcovitch
Secretary

PITTSBURGH
Head Speaks on Electroplating of Stainless Steel

Some fifty members of the Pittsburgh Branch enjoyed a guided tour of U. S. Steel's recently completed Research Laboratories in Monroeville. The group was divided into several smaller groups and a member of the laboratory staff conducted each through the spacious buildings. Two

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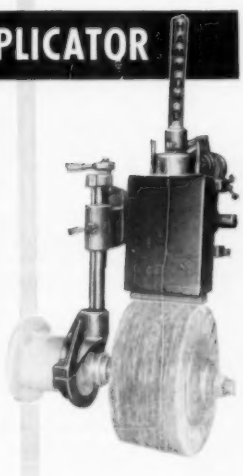

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hours were required for the tour, but this allowed only a few minutes at each section of the Laboratories.

A turkey dinner at the Gateway Plaza was enjoyed by 33 members before the regular business meeting. President **Myron Ceresa** opened the meeting and the first item of business was the voting into the Branch of two new members.

Rex Goldbach then presented a fine resume of the many contributions which **Frank Keller** of Standard Steel Spring Division, Rockwell Spring and Axle Co. has made to the Pittsburgh Branch and to the science of electroplating in years past. Frank was proposed as an honorary member of the Branch and the vote was unanimous. The formal presentation will be made at the annual Ladies' Night banquet in April at which Frank will be guest of honor.

A letter from National President **Samuel Heiman** was read, the subject of which was the possibility of having an Interim Meeting of the Supreme Society in Pittsburgh, January 12. The Branch voted to make arrangements for such a meeting and also to change the regular meeting night to January 11 so as to have an opportunity to be host to the Executive Board and Delegates. **Herberth Head,** our honored guest speaker for the evening, outlined what should be done to take care of the meeting.

Librarian **Dick Woehrle** then introduced Herb Head who talked on "Electroplating on Stainless Steel" and also on some of the issues of the National Society.

After a break for refreshments, Herb drew the name for the door prize. The winner was Myron Ceresa, Westinghouse. The donor was **Carl Reinheimer,** Westinghouse—a fine waffle iron. Drawing rigged?

A discussion of plating problems concluded the meeting.

Fred Stevens
Secretary

PROVIDENCE

President **Kershaw** called the October 15, 1956 Providence-Attleboro Branch of AES to order for the second meeting of the season, at the Providence Engineering Society Building, 195 Angul St., Providence, R. I.

James Potter was awarded the title of Honorary Member of the Branch. Potter has added substantially to the progress of the Providence-Attleboro Branch through the years he has been a member.

John Cahill, Librarian, introduced **Dr. Harold Narcus,** president and technical director of Electrochemical Industries, Inc. Dr. Narcus spoke on the subject: "Metallizing Non-Conductors." Some of the high points of the presentation were: sensitizing the non-conductive surface; making the initially conductive layer; and using an electroplated coating. Several examples of electronic circuitry with plating through holes were displayed.

On conclusion of the talk Dr. Narcus supplied many answers to questions.

There were thirty-eight (38) members present.

F. L. Sherman
Secretary

ROCKFORD
Past Presidents Honored

With 27 for dinner and 36 members and guests present for the technical session the first fall meeting of the Rockford Branch of the AES was held Monday, October 8, in the Winnebago Room of the Faust hotel.

At this meeting the past presidents of the Rockford Branch were the honored guests. After enjoying a delicious meal they were presented gold AES pins as a token of reward for their services by **William Geissman,** president. Those present to receive the pins were **Bert Harvey, Vern Wissen, Albert Overbey, E. J. Budden, Stuart Golding,** and **William Foley.**

The date of March 30 was decided on for the Annual Educational Session and Banquet to be held at the Faust Hotel. **Bob Twyning,** librarian, introduced **Dr. Henry Brown,** director of research of the Udylite Corporation of Detroit, Michigan, as speaker of the evening.

E. J. Budden
Secretary-Treasurer

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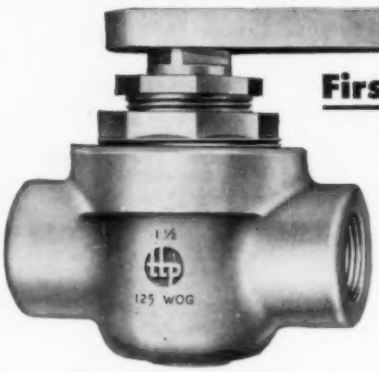

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ROCHESTER

Paper Presented on Dissolved Gases in Plating Baths

The October meeting of the Rochester Branch was held at the 40/8 Legion Club House and was called to order by President **Fred Thiem.**

Business matters discussed included: The election of a new member; the death of **Henry Burns,** a long-time member of the Rochester Branch; the Christmas party to be held December 8.

The librarian, **Lorin Correll,** introduced the speaker of the evening, **F. Beuckman,** our vice president, from Eastman Kodak Co. Beuckman presented the paper edited by **William Tucker** and himself which had been given at the 43rd annual national convention in Washington. The paper covered work performed in learning how to detect dissolved gases in plating baths as well as how to correct the condition once it has happened. The heavy nickel plating bath was discussed at length and even more so after the paper had been presented.

Linwood P. Morrison, *Secretary-Treasurer*

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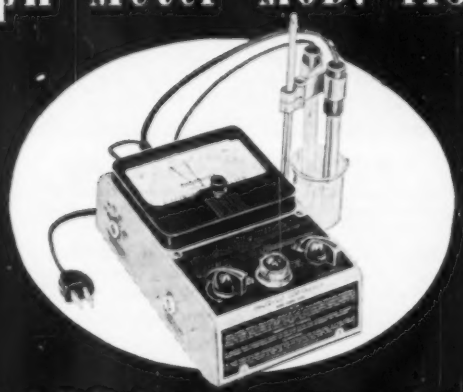

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FUTURE MEETINGS

AES

December 14—**Annual Meeting,** Newark Branch, Robert Treat Hotel, Newark, N. J.

December 15—**Christmas Party,** Newark Branch, Robert Treat Hotel, Newark, N. J.

January 11, 1957—**Special Interim Meeting-Pittsburgh Branch Dinner,** Gateway Plaza, Pittsburgh, Pa.

January 11-13, 1957—**Executive Board Meeting,** Penn-Sheraton Hotel, Pittsburgh, Pa.

January 12, 1957—**Interim Meeting,** AES Supreme Society, Penn Sheraton Hotel, Pittsburgh, Pa.

January 12, 1957—**Educational Session and Dinner Dance,** Cleveland Branch, Hotel Carter, Cleveland, Ohio

January 18, 1957—**Editorial Board Meeting,** Sheraton-Mount Royal Hotel, Montreal, Canada.

January 25, 1957—**Research Committee Meeting,** Conrad Hilton Hotel, Chicago, Ill.

January 26, 1957—**Annual Meeting,** Chicago Branch, Conrad Hilton Hotel, Chicago, Ill.

February 16, 1957—**Annual Educational Session and Dinner Dance,** Grand Rapids Branch, Parntlind Hotel, Grand Rapids, Mich.

March 30, 1957—**Third Annual Tri-State Regional Meeting,** French Lick Sheraton Hotel, French Lick, Ind.

March 30, 1957—**Annual Educational Session and Banquet,** Rockford Branch, Faust Hotel, Rockford, Ill.

INTERSOCIETY

January 28-31, 1957—**Plant Maintenance and Engineering Conference and Show,** Public Auditorium, Cleveland, Ohio

February 5-7, 1957—**12th Annual Technical and Management Conference,** Reinforced Plastics Division, The Society of the Plastics Industry, Edgewater Beach Hotel, Chicago, Ill.

May 12-16, 1957—**Electrochemical Society,** Statler Hotel, Washington, D. C.

CLASSIFIED ADVERTISEMENTS

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INDIANAPOLIS meets first Wednesday of each month at 6:30 P.M. at the Fox Steak House, 1207 E. Washington St., Indianapolis, Ind. Secretary, Paul B. Freeman, 316 N. Wallace St., Indianapolis, Ind.

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SYRACUSE BRANCH meets third Wednesday each month, dinner is at 6:30 P.M. Meeting is at 8 P.M. at Liederkranz, 621 Butternut Street, Syracuse, N. Y. Secretary is Milton F. Stevenson, 313 Beech St., North Syracuse 12, N. Y. Research Fund Chairman, K. S. Parnell, 829 Maryland Ave., Syracuse.

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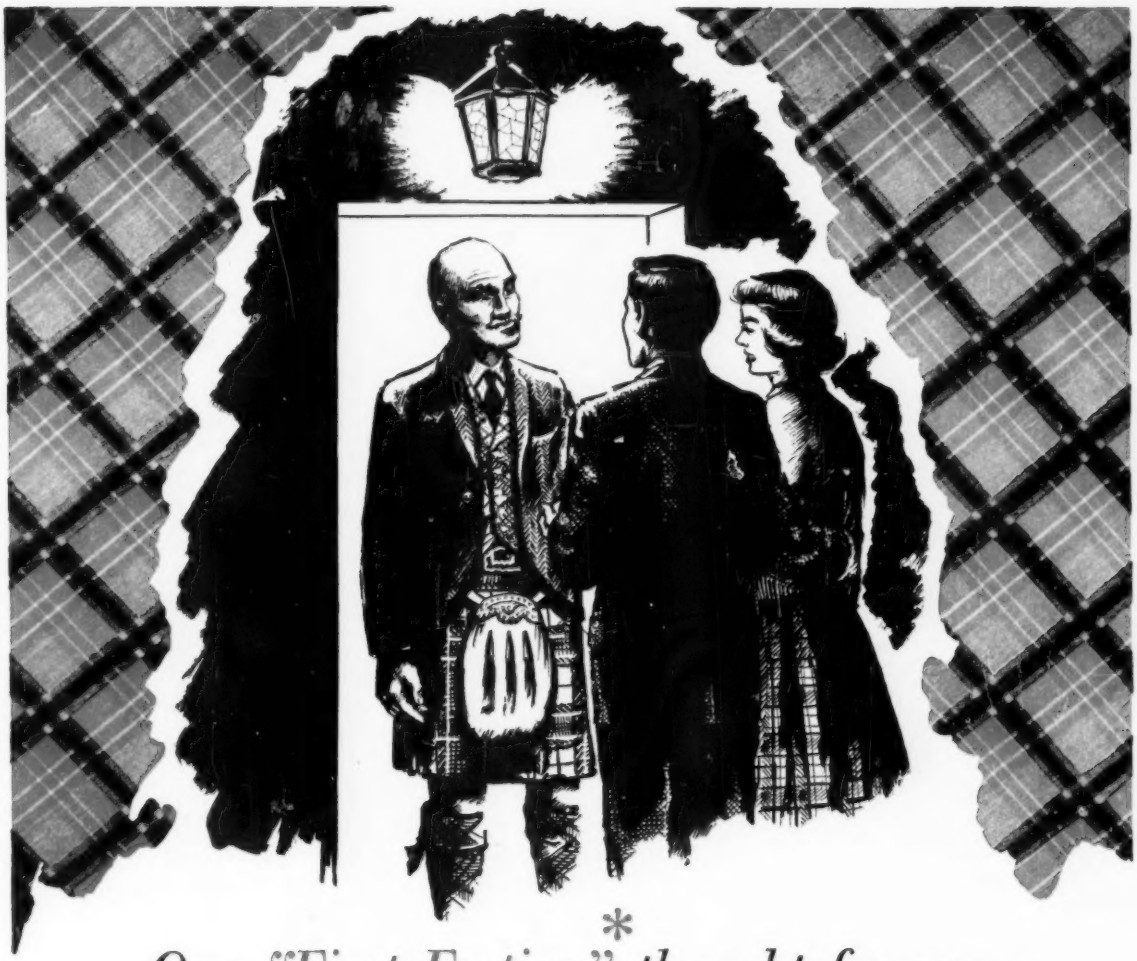

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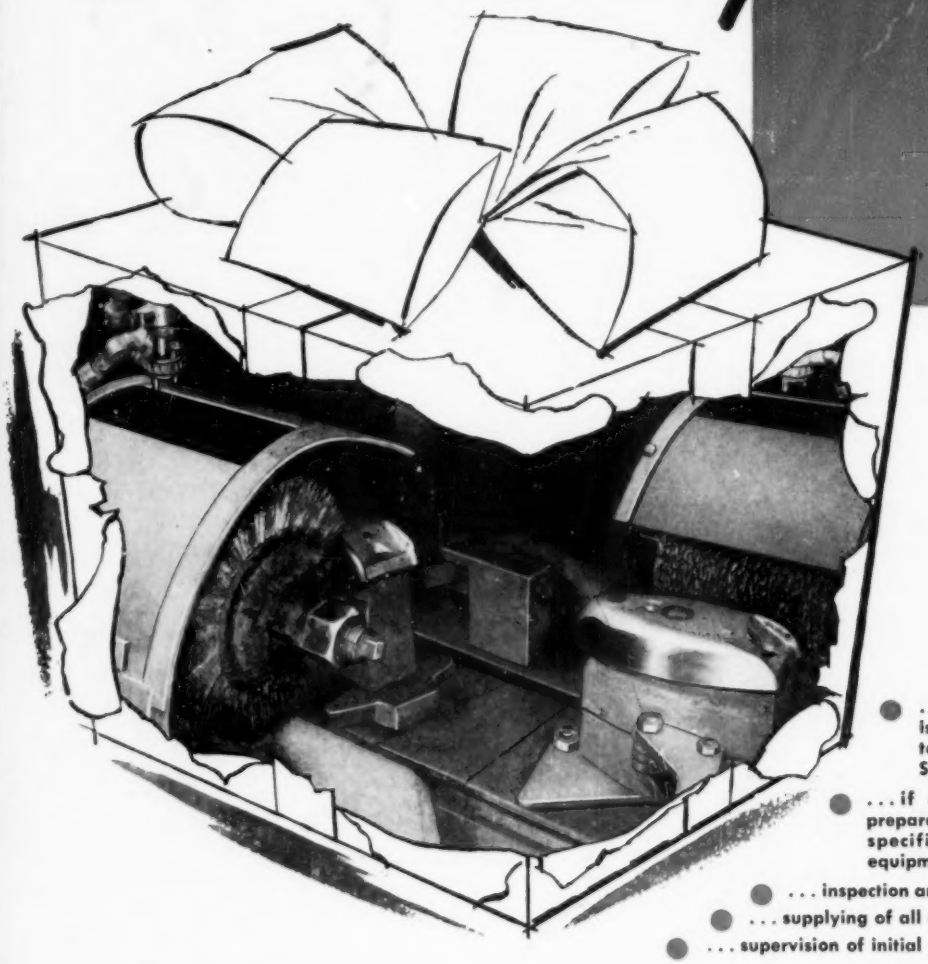

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